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International Pipelining Report

WORLD-WIDE ACTIVITY

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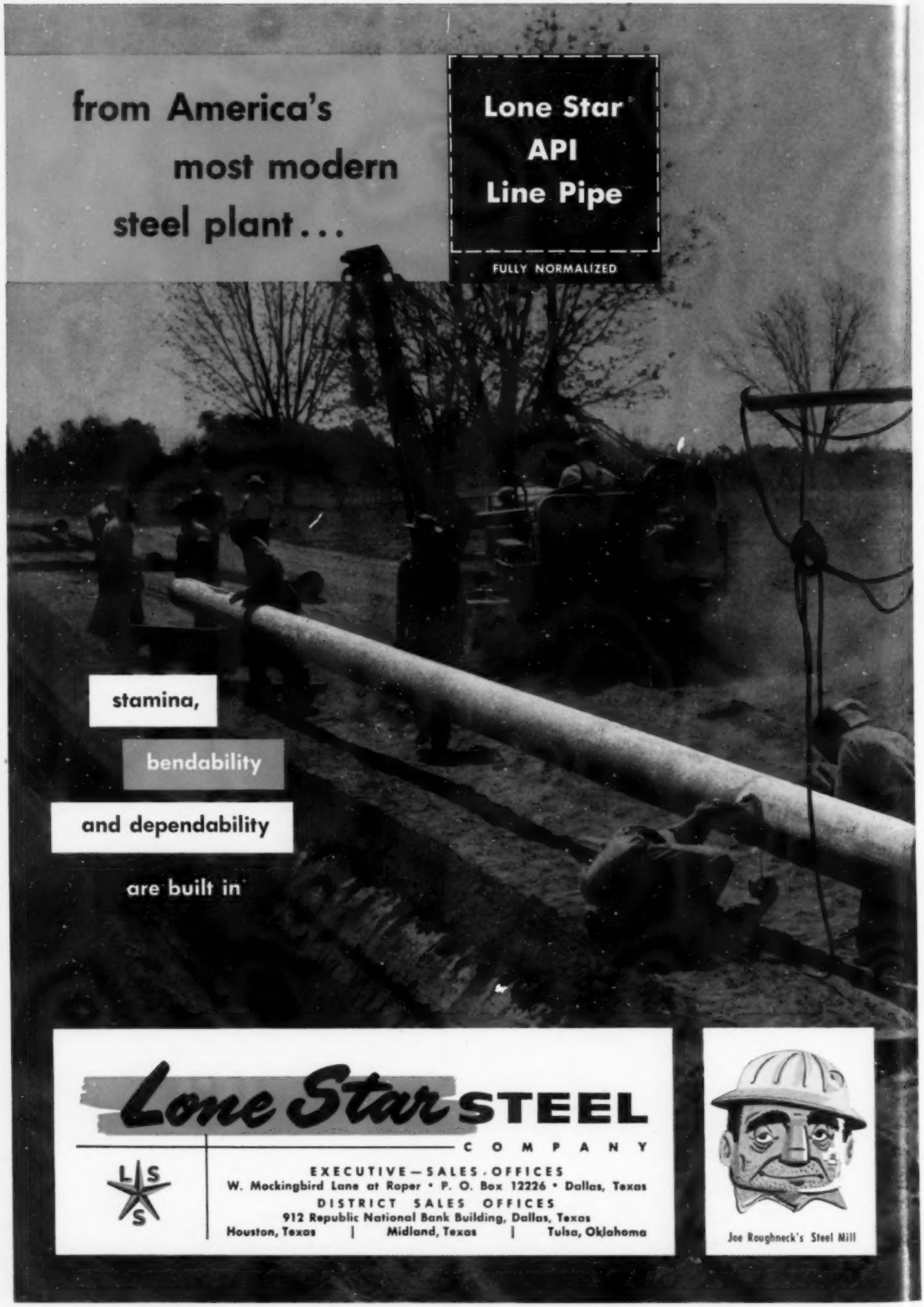

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PIPE LINE INDUSTRY

A GULF PUBLISHING COMPANY PUBLICATION

December 1961 Vol. 15, No. 6

CONTENTS and Quick Look

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

INTERNATIONAL PIPELINING

Construction is Booming Around the World

☐ More than 5,500 miles of major pipe line projects were completed or undertaken in 1961 with investments totalling nearly $400 million. The world's largest crude line is underway in France. In Algeria, another major crude line was constructed. Libya's first pipe line projects were undertaken and India's biggest system is making progress. Several other lines in Iran, Iraq, Italy, Canada, Mexico and Argentina are included in this roundup of international construction.

By Donald G. De Pugh.....Page 43

World's Largest Crude Line to Serve Europe

☐ A 472-mile 34-inch line is being laid from Lavera, a port near Marseille on the Mediterranean, across France and on into Germany. The line parallels the Rhone and Rhine rivers. Work on a 180-mile 26-inch extension from Karlsruhe across Germany's famed Black Forest to the Danube has started. The latter is scheduled for completion in 1963.....Page 50

Canadian Winter Mountain Pipelining "Easy"

☐ They have stretched the field working "season" from five months to eight. Contractors worked through most of the winter last year on clearing and grading, making road and river crossings, double jointing pipe, and a few have laid several miles of pipe line in winter months. Snowfalls of up to 20 feet were encountered in the British Columbia Rockies and temperatures down to 40 below are not unusual in Alberta and B. C. pipelining country.

By Melvin A. Judah.....Page 52

Pemex Lays Lines to Torreon and Chihuahua

☐ As with most new pipe line construction jobs, pipeliners came up with several new ideas. The one that saved the most money perhaps, was the idea of using a river bed for right-of-way through busy Monterrey. The products line was laid seven feet below the bottom of this normally dry river, in order to eliminate the construction hazards of pipelining through a city. In the mountainous regions, where conventional construction would have been extremely difficult, Petroleos Mexicanos laid the parallel lines on sleepers made of small diameter pipe.

By Francisco X. Peredo.....Page 56

Liquefied Coal Piped Directly Into Boiler

☐ Texas Eastern and Consolidation Coal have developed a 70-30 coal-water slurry that can be pipelined, stored without agitation and fed directly into a boiler.

By Donald M. Taylor.....Page 60

Fundamentals of Solids Pipelining

☐ Part 1 of this three-part article covers the past, present and future. Solid pipe lines are not new, but were first used in gold mining operations in California more than 100 years ago. The patent on coal-slurry pipe lines was granted as long ago as 1891. Few pipeliners realize how widespread solids pipelining is and how fast it is growing. Ford, Bacon & Davis has recently made studies on transporting six different materials for distances exceeding 500 miles.

By R. F. McNamara.....Page 64

Automatic Chart Changer Paying Off

☐ It changes the charts at the same time every day, and the unit will hold up to 32 charts. This device, which fits right onto the front of an orifice meter, eliminates frequent visits by service men.....Page 68

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Pipelining Moves Abroad . . . and PLI is there, too

HARDLY A DAY'S mail comes that we do not receive some correspondence from a pipeliner outside of the United States requesting information, assistance in contacting American sources of data or equipment or offering an idea for articles or news items. Answering these has become one of the most rewarding and important of our editorial staffs' tasks. Hundreds of U.S. pipeliners have assisted us in supplying answers and detailed information; our industry has gone a long way in exporting the best of American pipelining to others around the world, and those pipeliners have put these ideas to good use.

Pipeliners outside of the United States are interested in what goes on in the industry, as indicated by our 1,439 subscribers in 53 other countries. And with the tremendous developments in international pipelining, American pipeliners are endeavoring to become more informed about what is happening in other nations.

In this issue of PIPE LINE INDUSTRY, our aim is to provide a roundup of the important developments throughout the Free World in 1961. Every issue of PIPE LINE INDUSTRY is edited for leading American pipe line engineers, contractors, operations and management men and concentrates on subjects that are of top interest to them. But there is another important audience which reads the magazine each month even though to many of them it is written in a "second" language.

Brisk Construction Pace. The large number of PLI readers around the world is not the only indication of international pipe line activity. If pipe lines are the most economical and dependable means for moving gas, crude oil and products overland in the United States, it follows that they would be in other countries, also. In many countries the engineering, construction, and managing know-how of American pipeliners has moved overseas in cooperation with native skills and labor. Pipe line technology undoubtedly saw its greatest advances in the United States in World War II and the years following. As energy demands of other countries grow, the ideas learned in this period are being put to work by many around the world.

In each of the past five years PLI has surveyed Free World pipe line operators and the construction totals for pipe line mileage and station horsepower have risen each year. From 1957, when 5,268 miles of pipe line was laid, construction has reached 7,153 miles of pipe line for gas, crude oil and products in countries outside the United States in 1960. An estimated 9,695 miles are due for completion in 1961. New station horsepower during this period has grown from 75,947 in 1957 to 177,265 in 1960 and the estimated 210,900 horsepower scheduled for completion in 1961 almost triples 1957 station work.

Inter-Nation Cooperation. Perhaps it is not as easy yet to lay a pipe line across national boundaries as between states in the United States, but important gains in understanding have taken place there, also. The largest crude oil carrier in the world now under construction will link ports in southern France with French refineries and cross the border to serve German refineries also. The Netherlands and Germany have been linked with a major crude line; and another line in current construction will tie together Italy, Switzerland, Germany and Austria. Middle East lines cross several nations in working harmony and nations in North Africa have cooperated in pipe line construction projects.

This is not to make pipelining equivalent to Pollyanna in smoothing international relations. There are no known operating cross-country pipe lines under the Iron Curtain; and it would be difficult at the moment to link an Arab nation and Israel but progress is being made in workable understanding to the benefit of many nations. It would seem difficult to argue that this improvement in relations with justice between nations has not been a good thing.

Melvin A. Judah

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GAS

comes to Grandyle Village ...through Bethlehem line pipe

Into the ground it goes! Much of the Bethlehem pipe used on this project was plastic-coated with X-TRU-COAT by Pipeline Service Company, Sparrows Point, Md.

Iroquois Gas Corporation began laying distribution lines early in 1961 in Grandyle Village, a promising new suburb on Grand Island in New York State's Niagara Frontier. Connected to a 12-in. line laid under the river last Fall, these lines will bring gas to an initial 400 customers by the end of the year. The company estimates that, at the end of the 3-year, first-phase of the project, more than 80 per cent of the island's consumers will be hooked up to their lines. Some 170,000 ft of 2- to 6-in. line pipe will be involved, the great majority of it coming from Bethlehem's continuous buttweld and electric resistance-weld mills at Sparrows Point, Md.

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Grand Island Is Booming

Just south of the Falls, the Niagara River divides to flow around an island larger than Manhattan. Virtually undeveloped until 1935 when two new bridges provided access to the mainland, Grand Island is one of the most promising growth areas on the Niagara frontier. Home and industrial construction is booming, stimulated by far-reaching plans to bring community services—such as natural gas service—to within reach of every corner of the island.

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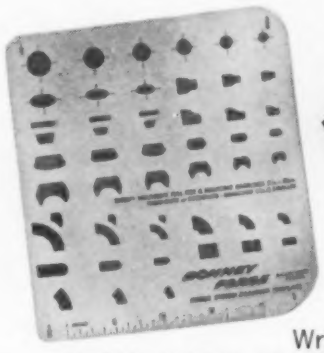

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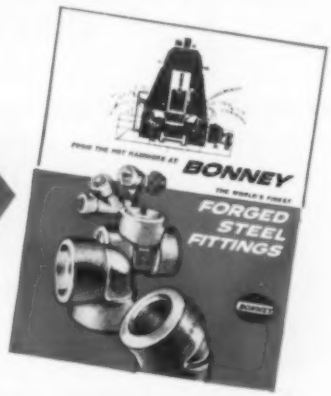

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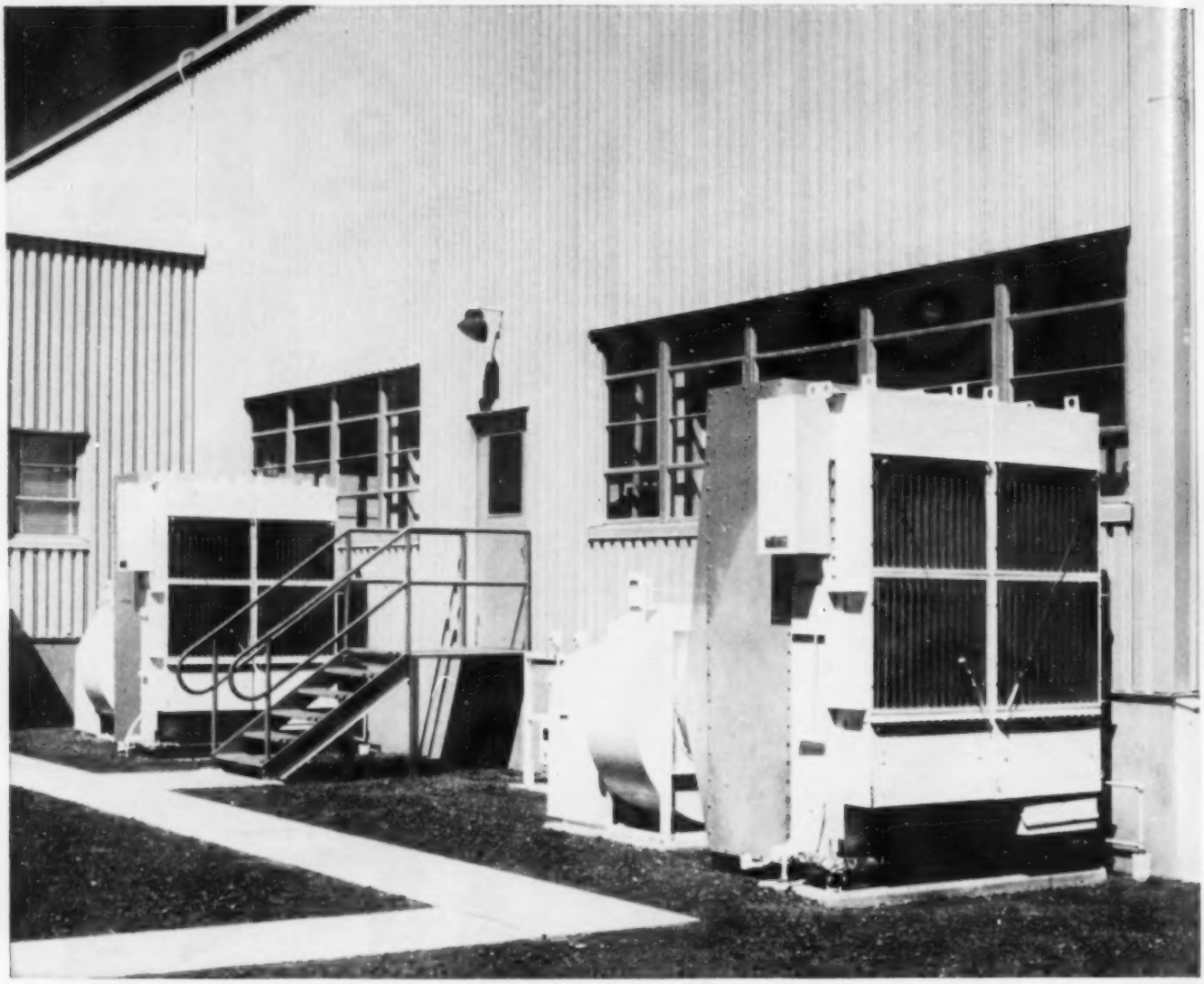

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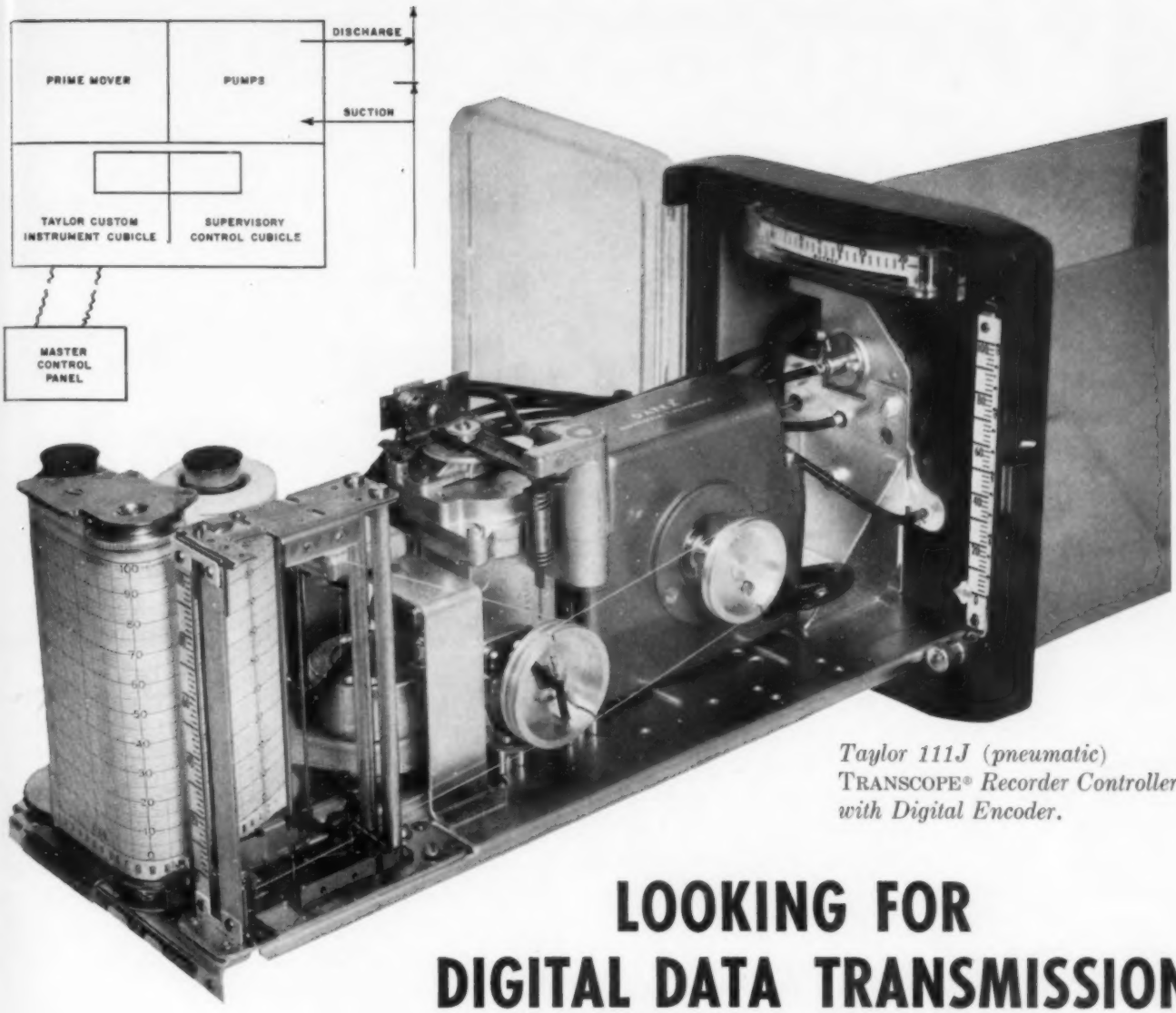

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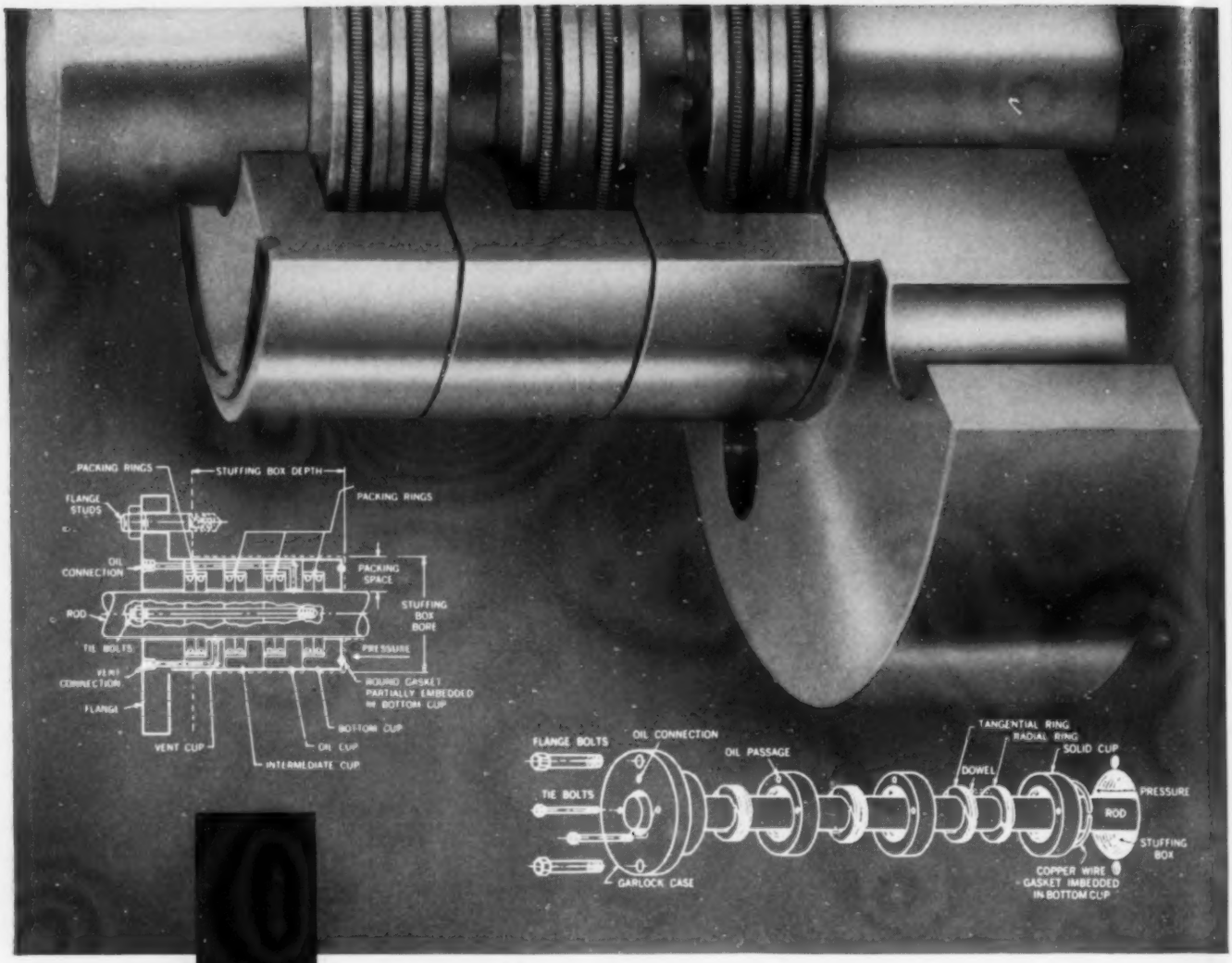

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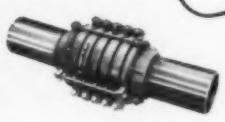

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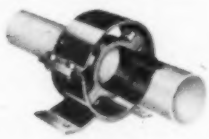

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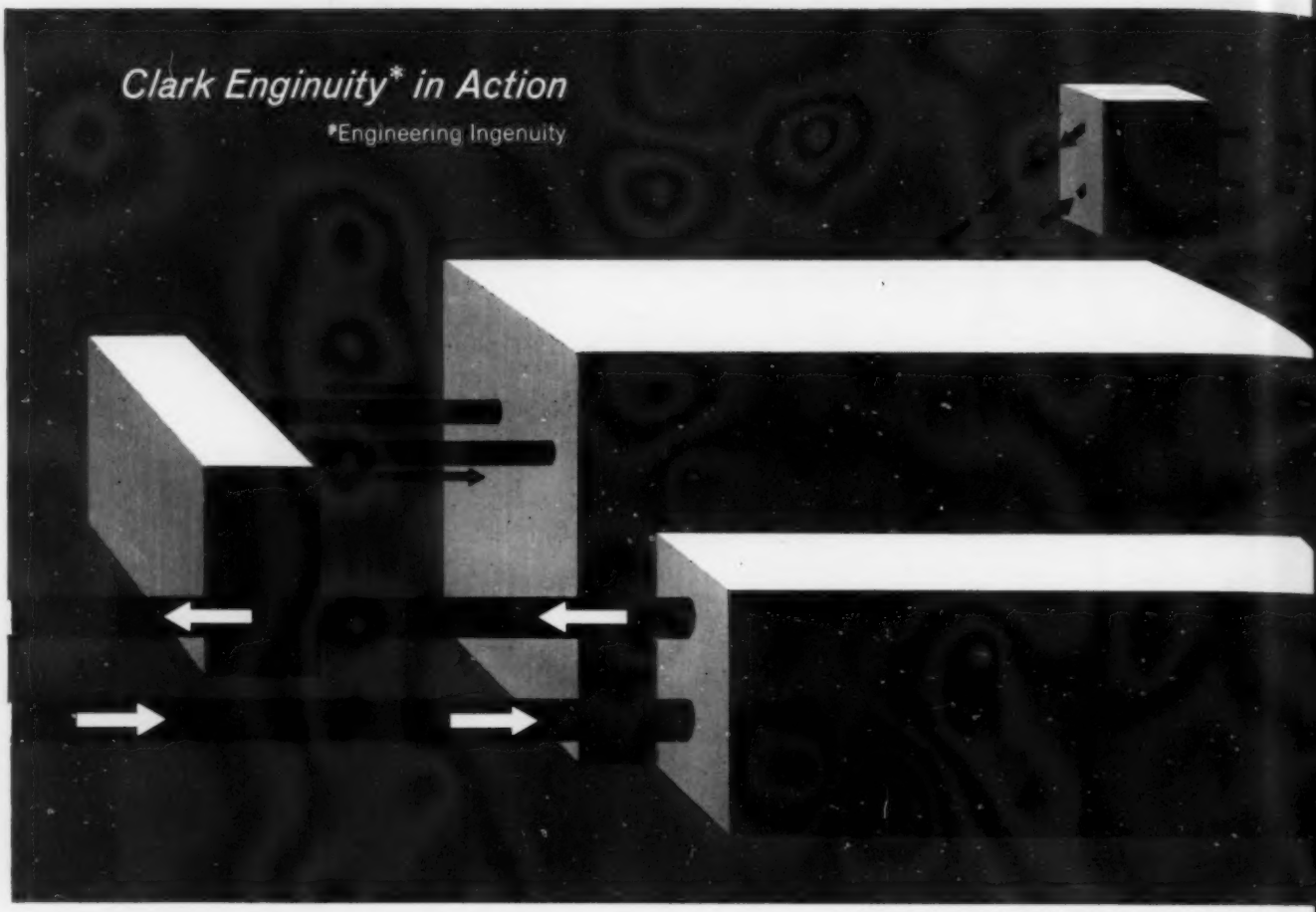

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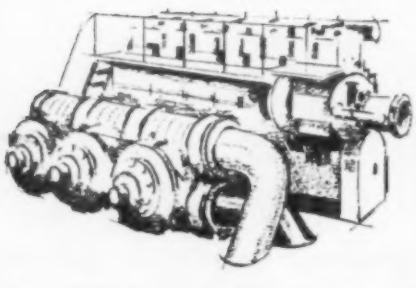

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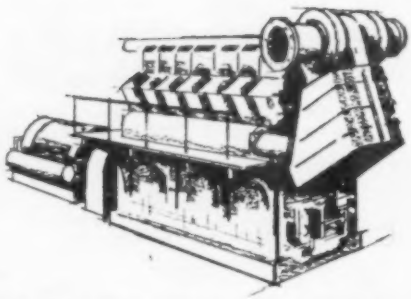

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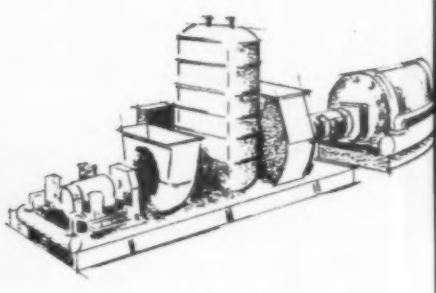
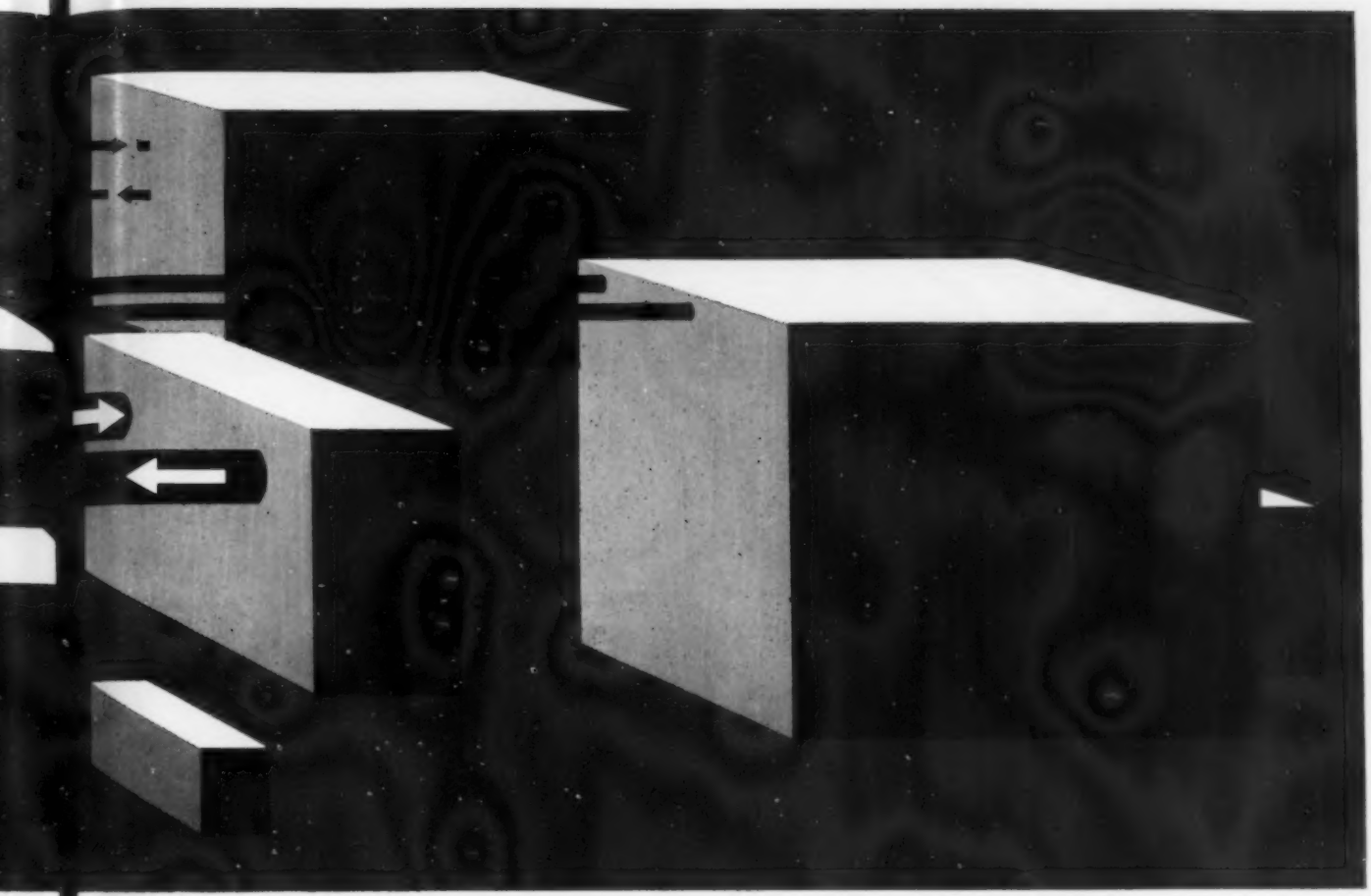


Gas Turbine Compressor Units.



Compressor station equipment in modules—That's the latest big news from Clark . . . and it's your cue to one of the soundest, most far reaching proposals ever made for reducing compressor costs.

Here's how the Clark modular system works—Taking a look at high compressor station costs, particularly the expensive field labor required to install all the equipment, Clark engineers came up with a bold new manufacturing plan to help operators save money: First, arrange station equipment into related modular systems. Second, engineer and fabricate each module *completely* at the factory under controlled shop conditions and with efficient labor. Third, ship the modules to the job site, ready for quick, easy hookup.

Substantial all-around savings—Startling in its simplicity, the Clark *Modular System* offers numerous opportunities to cut costs. Here are a few:

- Pre-engineering drastically reduces the user's engineering workload and cuts down elapsed time from project go-ahead to startup.
- Field fabrication is sharply reduced. Just locate modules and run piping to and from the driver.
- Delays and other hazards of "cut and try" field installation are eliminated.
- Each module is complete within itself, not dependent upon other systems for satisfactory operation.
- Orientation and location of modules can be varied to suit any installation or terrain requirement.
- The modular system permits compressor installation on a simple, easily poured concrete slab.
- Additional compressors with their accompanying modular auxiliaries can be readily and quickly installed as the station expands.

Sound interesting? Your nearby Clark representative has a remarkable story to tell, complete with facts, figures, engineering drawings and economic comparisons. Contact him today.

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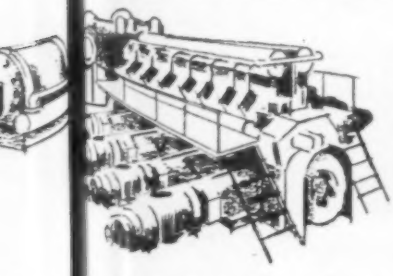

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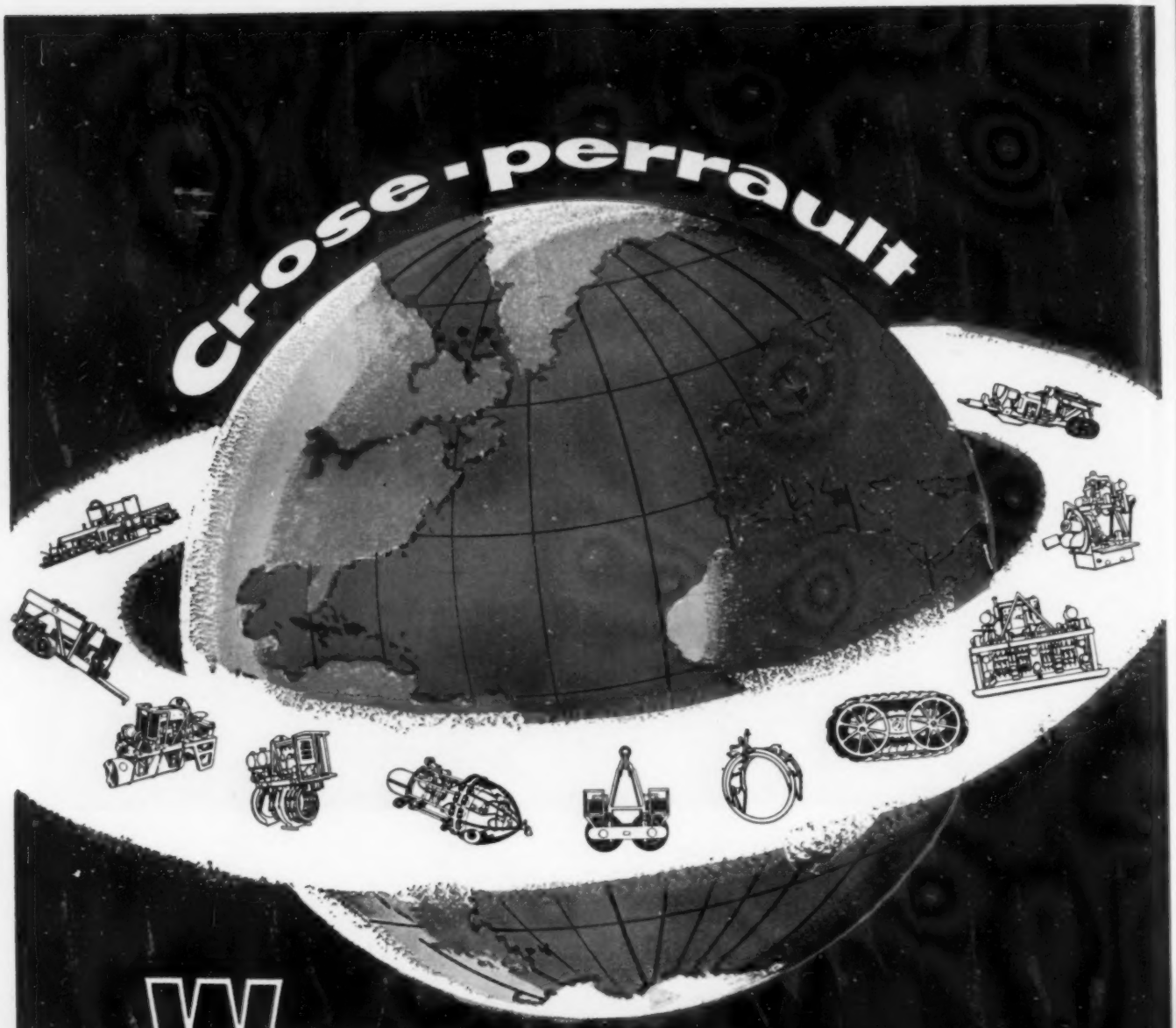

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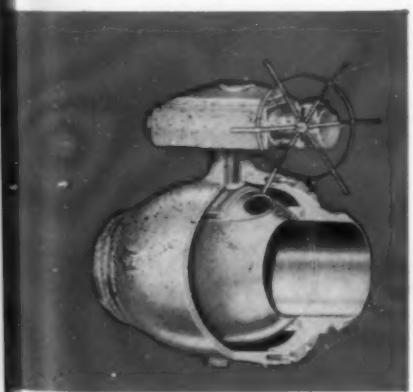

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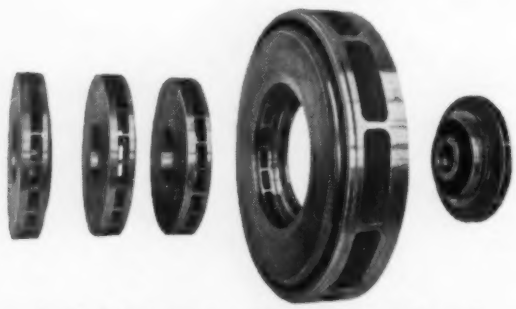
How Solar gas turbine compressor sets with interchangeable stages offer users low cost, versatility

The advent of Solar gas turbine-powered centrifugal compressors is ending the long-time dependence on reciprocating power for the low volume gas compression range under 1600 inlet scfm.

It has long been known that a centrifugal compressor would be less expensive to own and operate in this range if an efficient, long-life driver were available.

The introduction by Solar of an industrial gas turbine driver in the small horsepower range has resulted in a centrifugal compressor unit which has the advantages of low installation and maintenance costs as well as versatility and portability.

Through use of a concept of interchangeable staging, operators of Solar compressor sets have at their fingertips an almost infinite capability to meet changing flows and pressures—within the conditions of 1.15 to 3 ratios, 200 to 2000 hp and 200 to 1600 inlet cfm. This is accomplished by a set of five pre-engineered compressor wheels—A through



Each of 5 compressor wheels (right) may be used with diaphragm (center) and choice of 3 guide vanes (left) to meet any pressure, flow requirements.

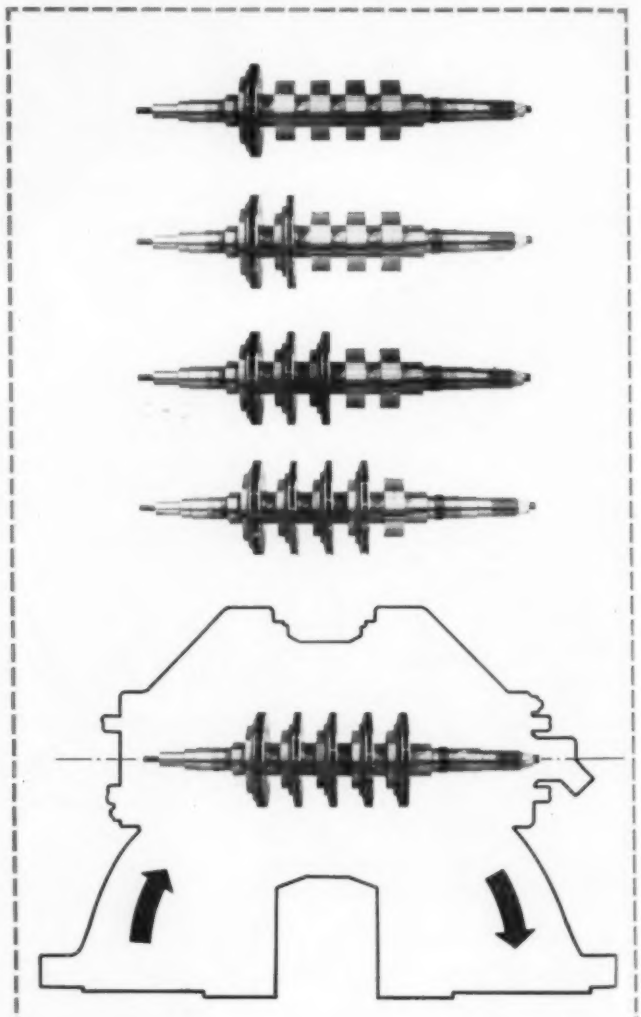
E—each of which has a choice of three different guide vanes and a diaphragm. By selection of these 25 basic parts—five wheels, fifteen guide vanes, five diaphragms—any flow and pressure in the low volume range can be met quickly and easily.

For instance, to meet a certain set of conditions, two "B" wheels and a "C" wheel with specified guide vane configurations might be prescribed. When these conditions change, a new setup requiring one "B" wheel, one "C" wheel and one "D" wheel might be necessary, again with the specified guide vane configurations.

All that is required to meet the change is substitution of new wheels in the same compressor on the same shaft in the same axial space—an operation which can be done easily and quickly on site. And all wheels, guide vanes and diaphragms are available for instant delivery from Solar's pre-engineered, on-the-shelf stock.

Solar 1100 hp *Saturn* turbine-driven compressor sets weigh 15,000 lbs—approximately ⅒th the weight of comparable reciprocating machinery. They occupy less than 300 cubic feet. These factors mean they are less expensive to install and easily portable to a new site for periodic maintenance.

They are currently in service in several pipeline and field boosting applications. For more information, write to Solar, Dept. J-177, San Diego 12, California.



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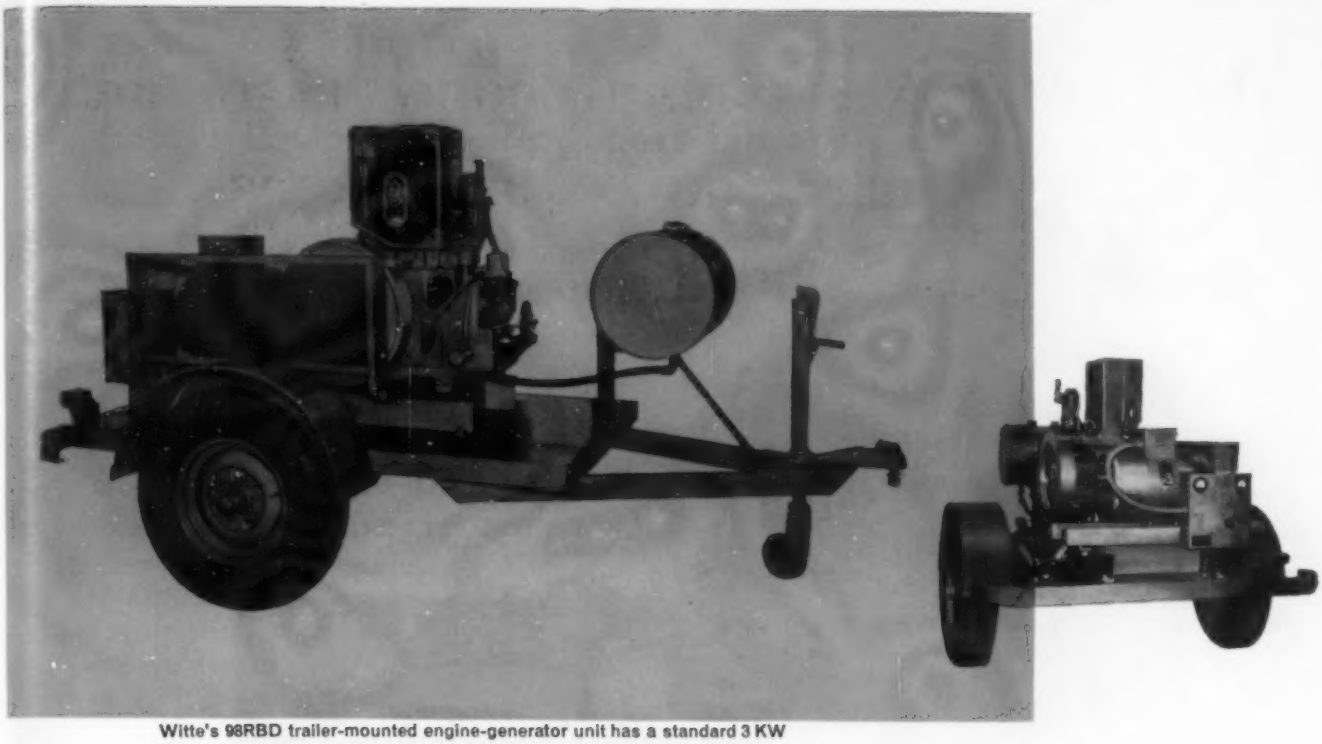

Witte's 98RBD trailer-mounted engine-generator unit has a standard 3 KW DC shunt-wound generator in a wide speed range from 750 to 1800 rpm.

Witte 98RBD Cathodic Protection Unit enables you to offer pipeline customers another profitable service!

Here is a heavy-duty, highly mobile, cathodic protection unit that will enable a pipeline contractor to provide an added service to his customers. This engine-generator unit will afford him an opportunity of recommending and furnishing the necessary amount of protection when the pipeline is installed.

It is a known fact that a corroded pipeline cannot be restored, but corrosion loss can be stopped if cathodic protection steps are taken in the early stages of a pipeline installation.

Witte's 98RBD is built especially for this type of continuous operation. The heavy-duty oilfield-type gas engine has been thoroughly field-tested. It has a low center of gravity, is well-balanced, and every part is easily accessible. The engine has condenser cooling, removable wet cylinder liners, and roller main bearings. It is equipped for long-run service, having oil make-up reservoir and float valve as well as lube oil and cooling water safety controls.

These trailer-mounted units have a 32-40 volt, 3 KW generator in a wide speed range from 750 to 1800 rpm. They are V-belt driven, with a voltage control to less than 5 volts when the generator speed is 750 rpm.

Complete information on both the standard and trailer-mounted Witte gas engine-driven generator units is available through oilfield supply stores.

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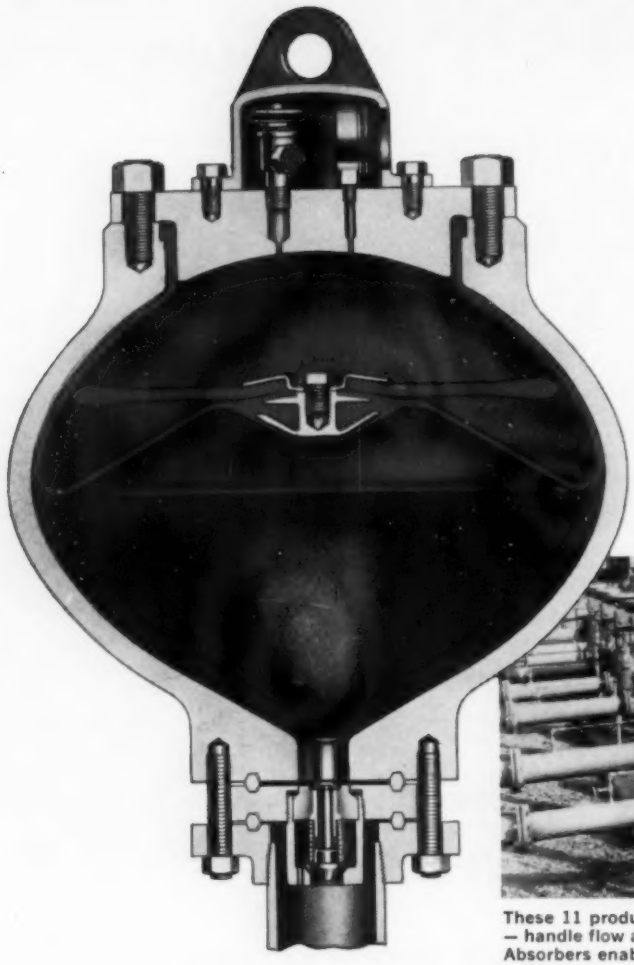
Offices and Plant: Kansas City 26, Missouri

prolongs life of pipelines, fittings and pumps... saves downtime... cuts maintenance costs!



These 11 product transfer lines — some over 1,000 feet long — handle flow at the rate of 1,600 gpm each, yet Hydril Surge Absorbers enable them to be closed in a fraction of a second without over-pressuring lines, fittings or metering equipment.

HYDRIL TYPE "K" SURGE ABSORBER

smooths out shock and pulsation in pipelines

QUICK-CLOSING VALVES and piston-type pumps punish pipelines by imposing sudden peak pressure loads. Unless these surges can be absorbed or smoothed out, pipe and fittings are exposed to stresses which may cause costly failure.

Hydril Type "K" Surge Absorbers are successfully controlling many types of line surge and pulsation in petroleum product handling lines, water pumping systems and oilwell repressuring programs. Simple design and construction assures long, trouble-free operation. This same oil field-proven Hydril design has been used for many years as a pulsation dampener on high-pressure oilwell mud pumps. Servicing, though rarely required, is readily performed without special tools and without shutting down the system or removing the unit from the line. Available in a wide range of sizes and pressure ratings.

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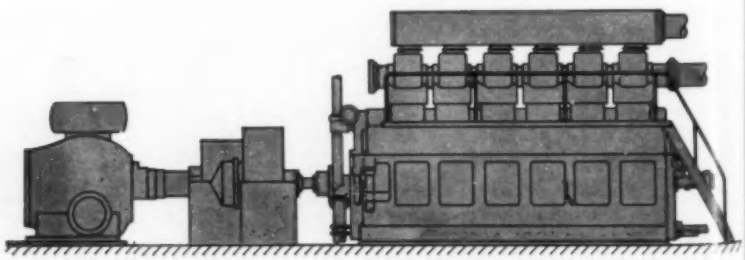
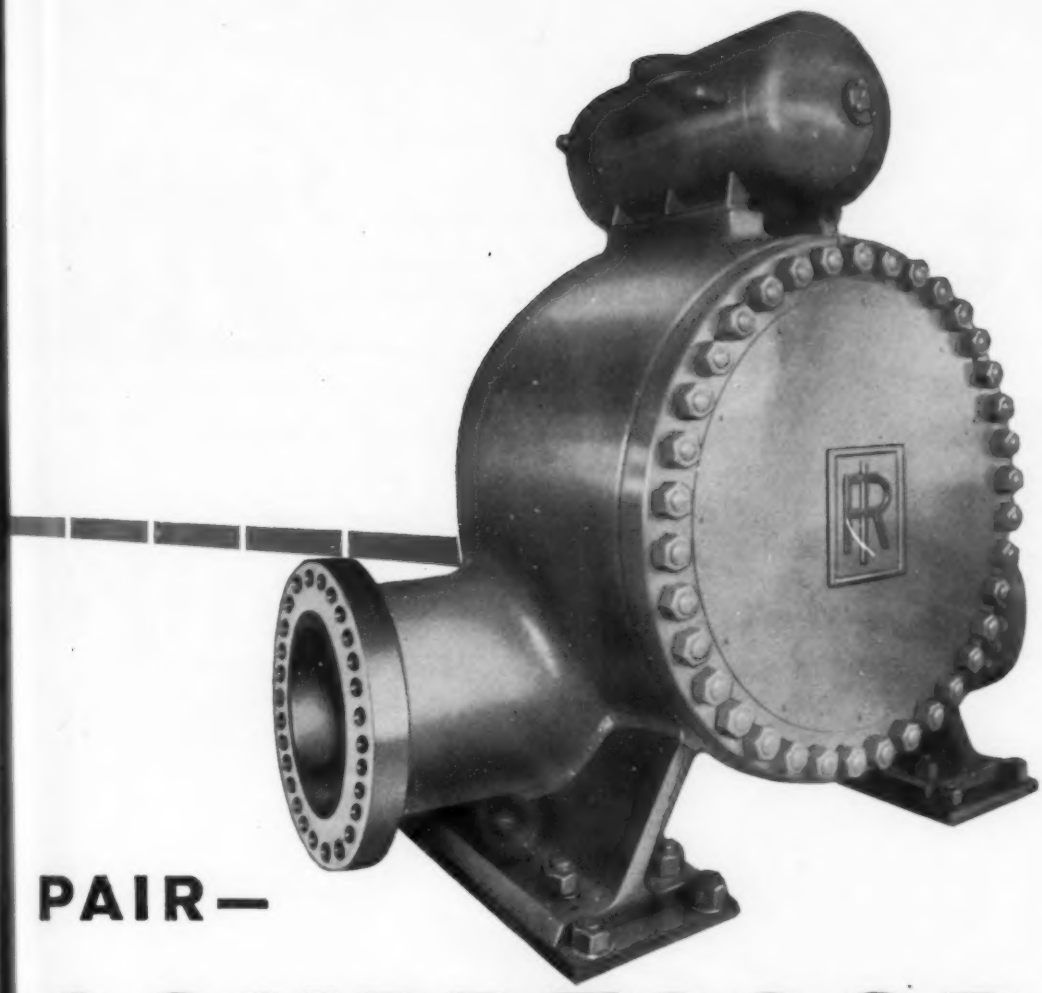


Perfectly matched for top performance and economy, the PKVT gas engine and the CDP centrifugal compressor make a pace-setting pair for dependable, low-cost pipeline compression.



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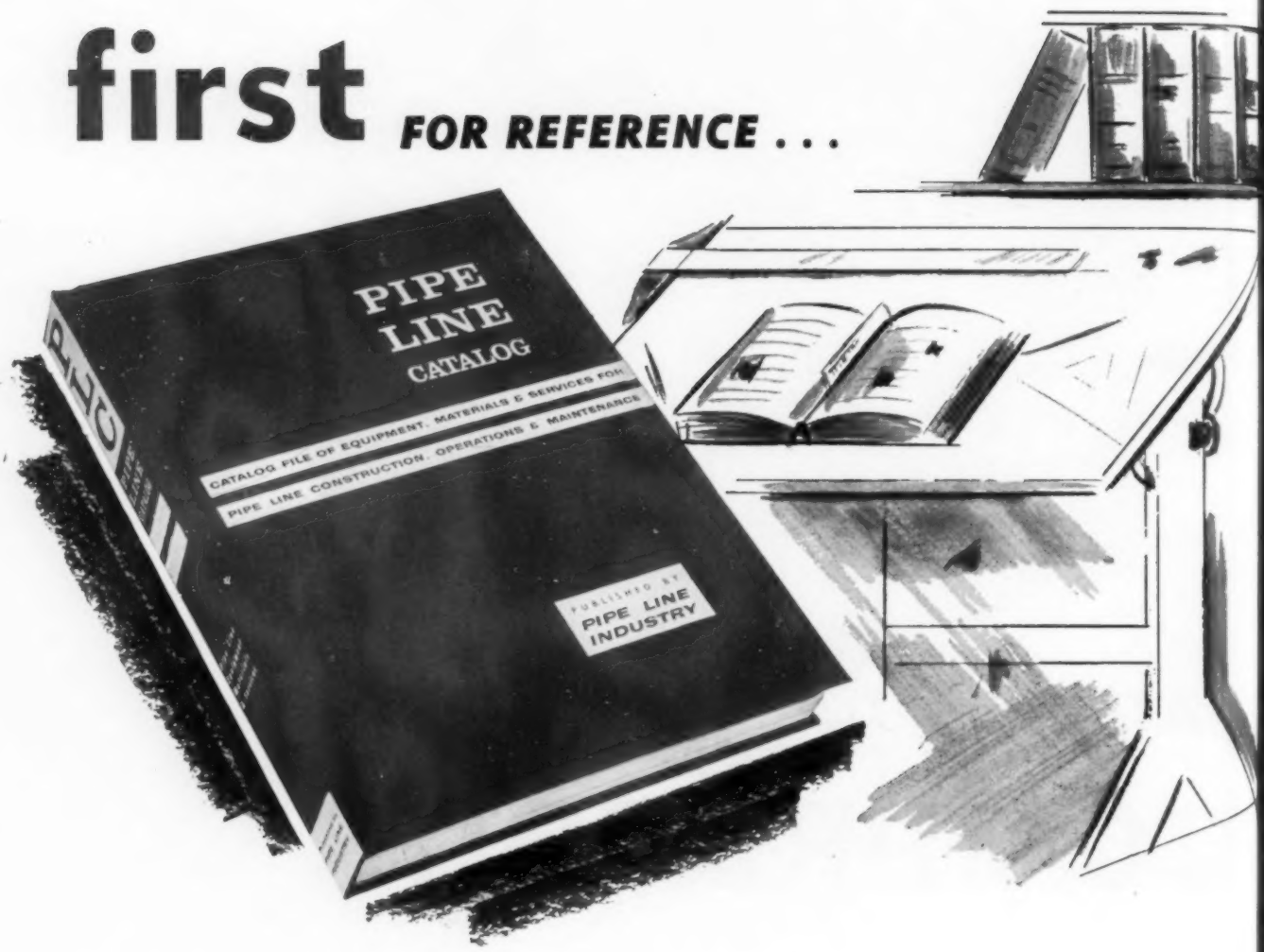

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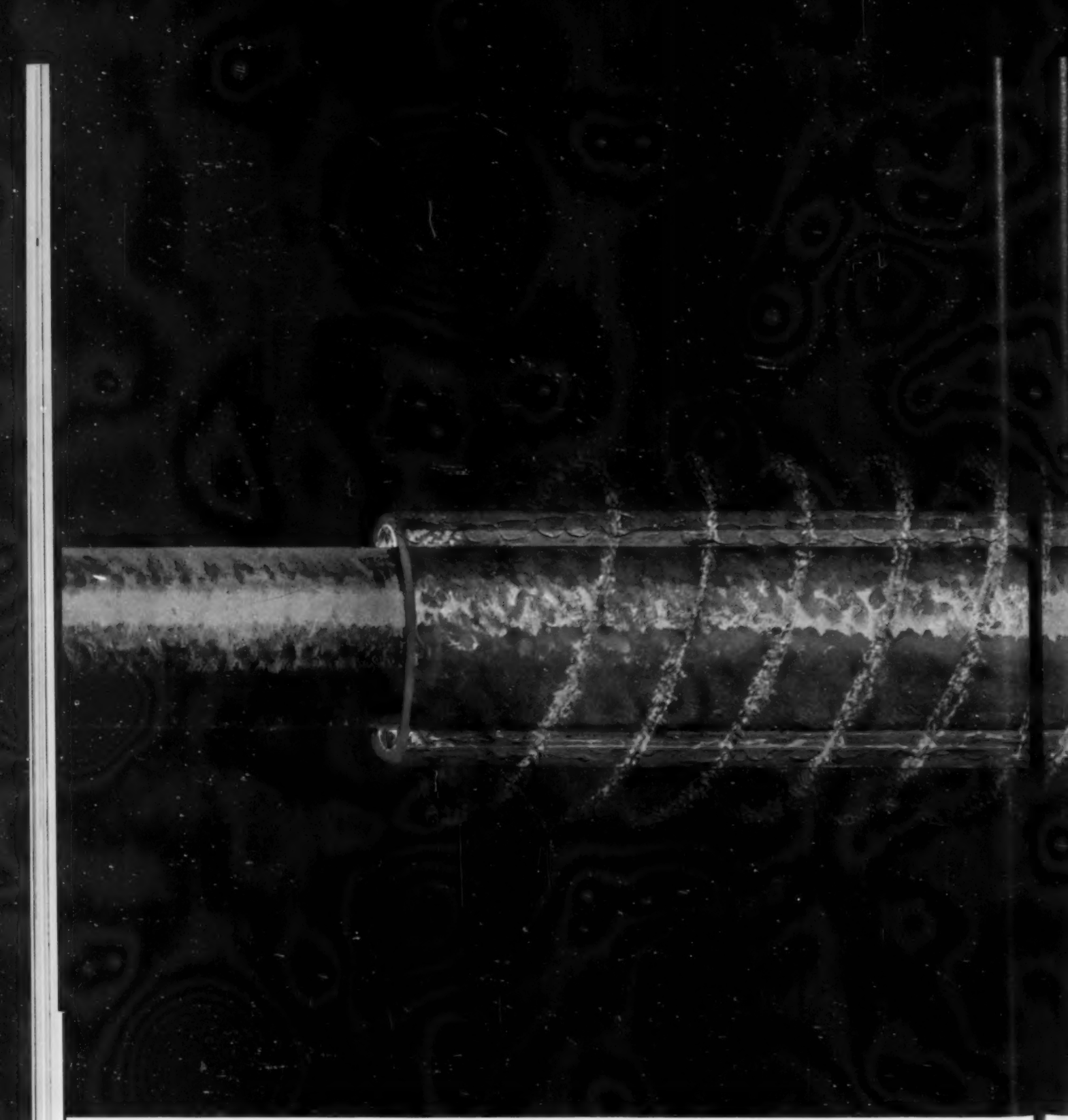

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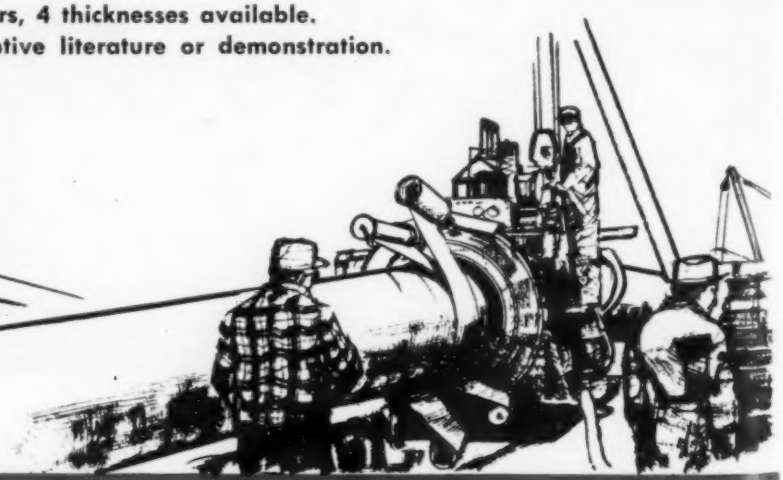

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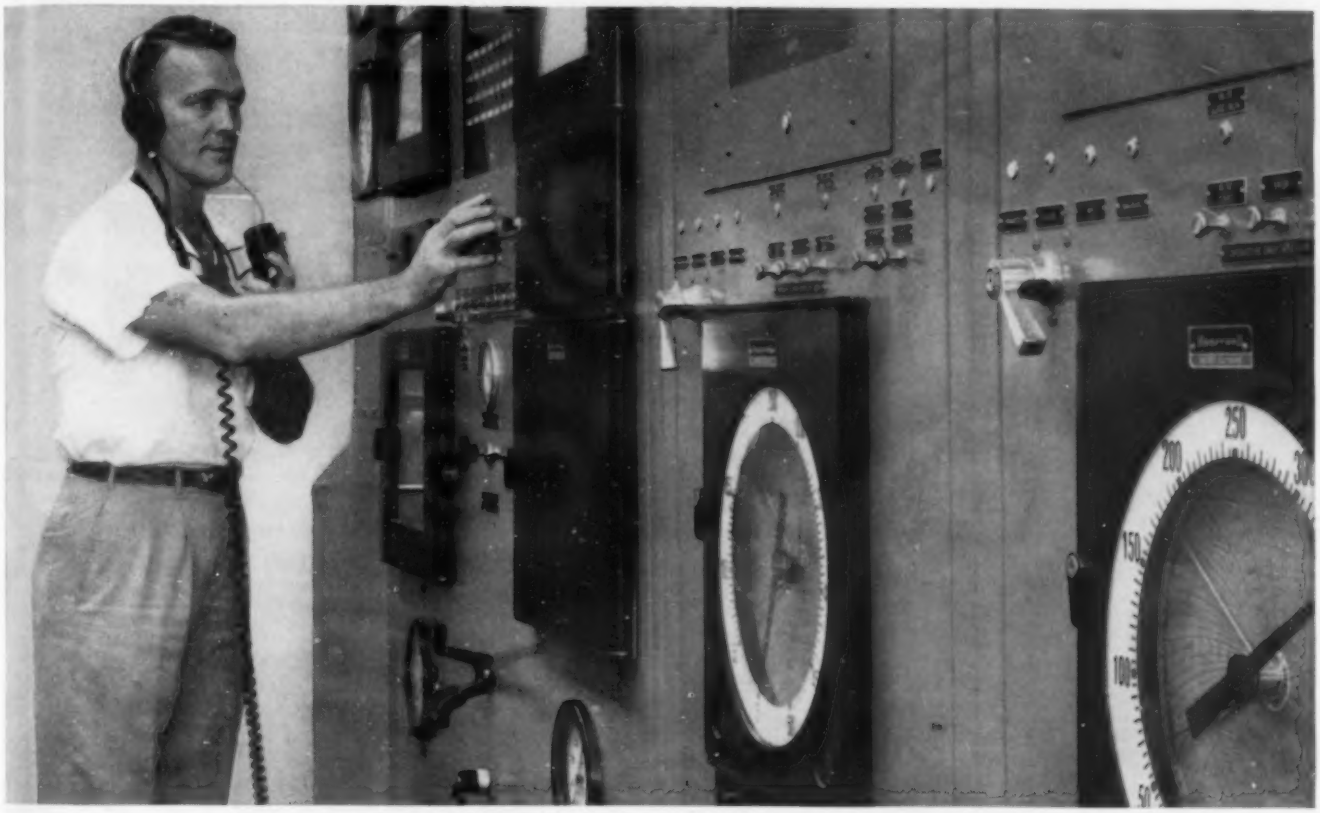

Honeywell instrumentation helps to keep the entire operation of this and other compressor stations on complete automatic control. This control system includes equipment for measuring discharge pressure, suction pressure, flow, compressor speed, and other operating conditions. Duties of the attendant are restricted to maintenance tasks at the station which is controlled by a central dispatcher. Attendant is connected by head set to various key points in this station.

Honeywell Discharge Pressure Controllers on the Transwestern pipeline deliver the high accuracy and dependability needed for the effective control of compressor engine speed. By executing every demand with precision and dispatch, these instruments ensure optimum operating economies. Units are furnished complete with integral analog to digital converters, digital to analog remote setpoint drive units, deviation detectors, and other features designed specially for pipeline operation. Honeywell instrumentation is readily adaptable to specific compressor station requirements.

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Get complete details on Honeywell compressor station controls and other pipeline instrumentation by contacting your nearby Honeywell field office. MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa. In Canada, Honeywell Controls, Ltd., Toronto 17, Ontario.

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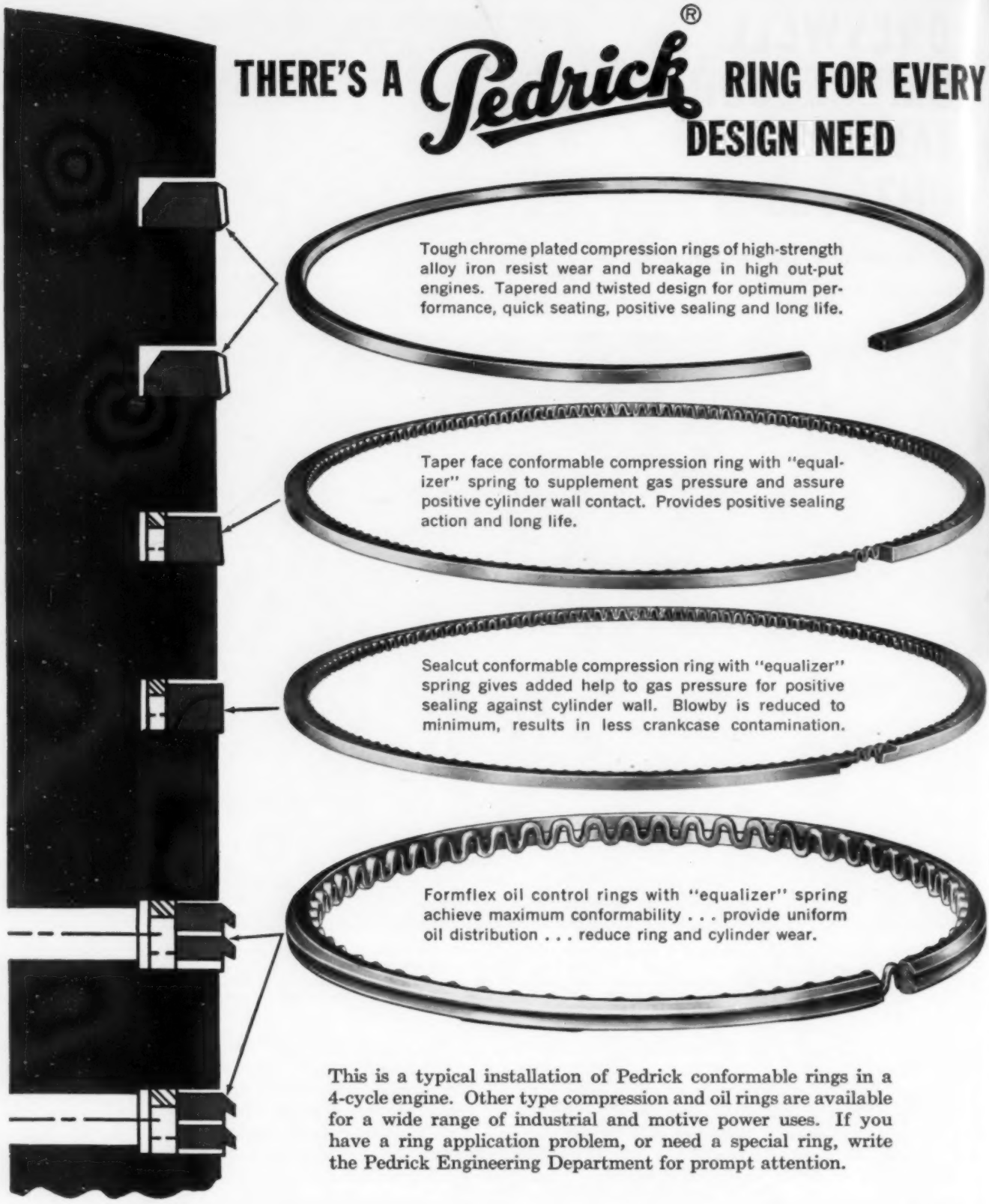


Tough chrome plated compression rings of high-strength alloy iron resist wear and breakage in high out-put engines. Tapered and twisted design for optimum performance, quick seating, positive sealing and long life.

Taper face conformable compression ring with "equalizer" spring to supplement gas pressure and assure positive cylinder wall contact. Provides positive sealing action and long life.

Sealcut conformable compression ring with "equalizer" spring gives added help to gas pressure for positive sealing against cylinder wall. Blowby is reduced to minimum, results in less crankcase contamination.

Formflex oil control rings with "equalizer" spring achieve maximum conformability . . . provide uniform oil distribution . . . reduce ring and cylinder wear.

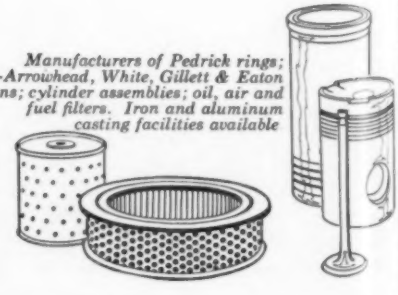
This is a typical installation of Pedrick conformable rings in a 4-cycle engine. Other type compression and oil rings are available for a wide range of industrial and motive power uses. If you have a ring application problem, or need a special ring, write the Pedrick Engineering Department for prompt attention.

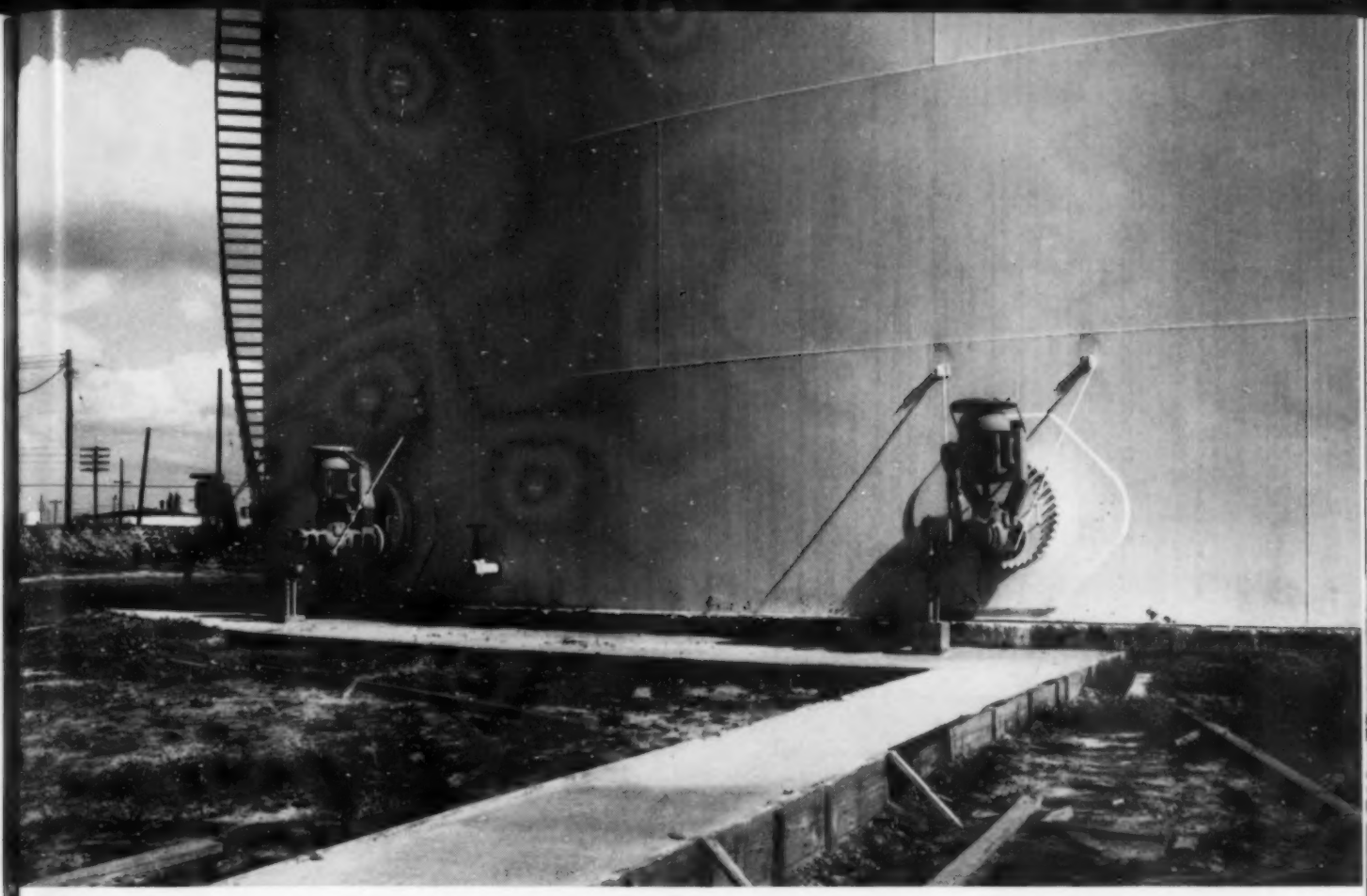
Gould-National GN

ENGINE PARTS DIVISION
GOULD-NATIONAL
BATTERIES, INC.
St. Paul 1, Minnesota

Superior-Arrowhead is a trademark of Gould-National Batteries, Inc.

Manufacturers of Pedrick rings; Superior-Arrowhead, White, Gillett & Eaton pistons; cylinder assemblies; oil, air and fuel filters. Iron and aluminum casting facilities available





How they keep crude from **stacking up like pancakes**

Surging into this tank come crudes from wells scattered over 23 counties.

Out of the tank comes *one* crude, at the right gravity to feed to refineries more than 450 miles away.

For the men who run the tank farm, it's no chore at all to blend 122,000 barrels of crudes ranging from less than 20° to above 85° in gravity. They do it by flipping three switches.

The LIGHTNIN Mixers you see here do the rest. While the tank is filling, and for two or three hours before it goes on suction, the mixers create a powerful, steady turnover that breaks up stratification from the bottom up. The outgoing tender of crude stays within a degree or two of constant gravity.

Control BS&W, too. That's not all. These mixers help keep sludge from settling on the tank bottom and stealing valuable storage space. They keep the tank working at its full capacity.

Multiply these savings by the number of tanks at this farm equipped with LIGHTNIN Mixers—and you can see why more than 50 pipeline companies and 35 leading oil companies use this easy way to keep operating costs in line.

How about you? If you'd like to see how LIGHTNIN Mixers on your big tanks can save you as much as $1000 per tank per year, call in your LIGHTNIN representative. He's listed in Composite Catalog. Or write us today.

YOU CAN ADD as much as 12% extra storage capacity to your tank farm—by using LIGHTNIN Mixers to keep tanks free of space-eating sludge. Mixing results are unconditionally guaranteed.

Lightnin® Mixers

MIXCO fluid mixing specialists

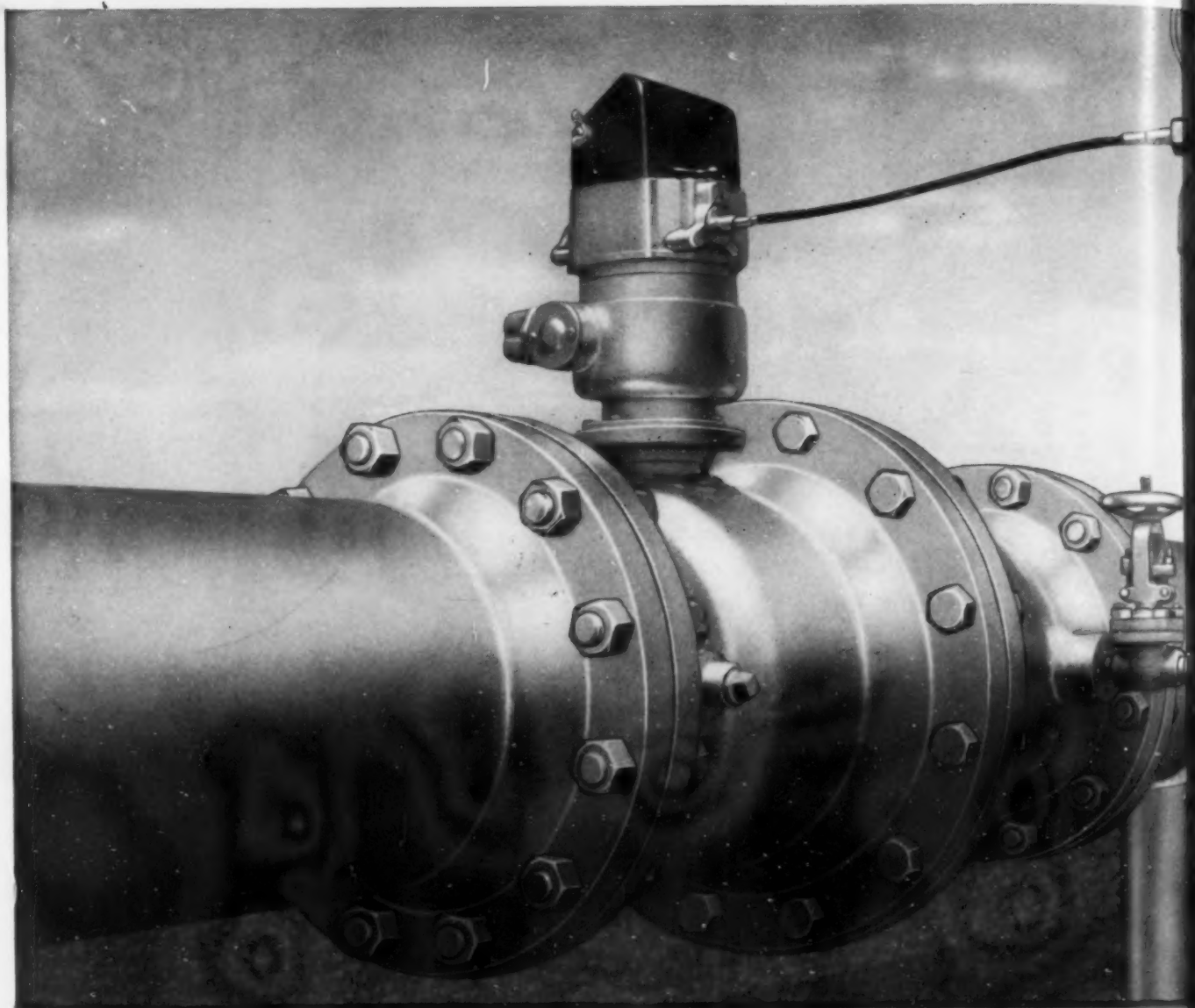
Get these helpful bulletins on BS&W control and LIGHTNIN Mixers. Check, tear out and mail to us today with your name and company address. Free—no obligation.

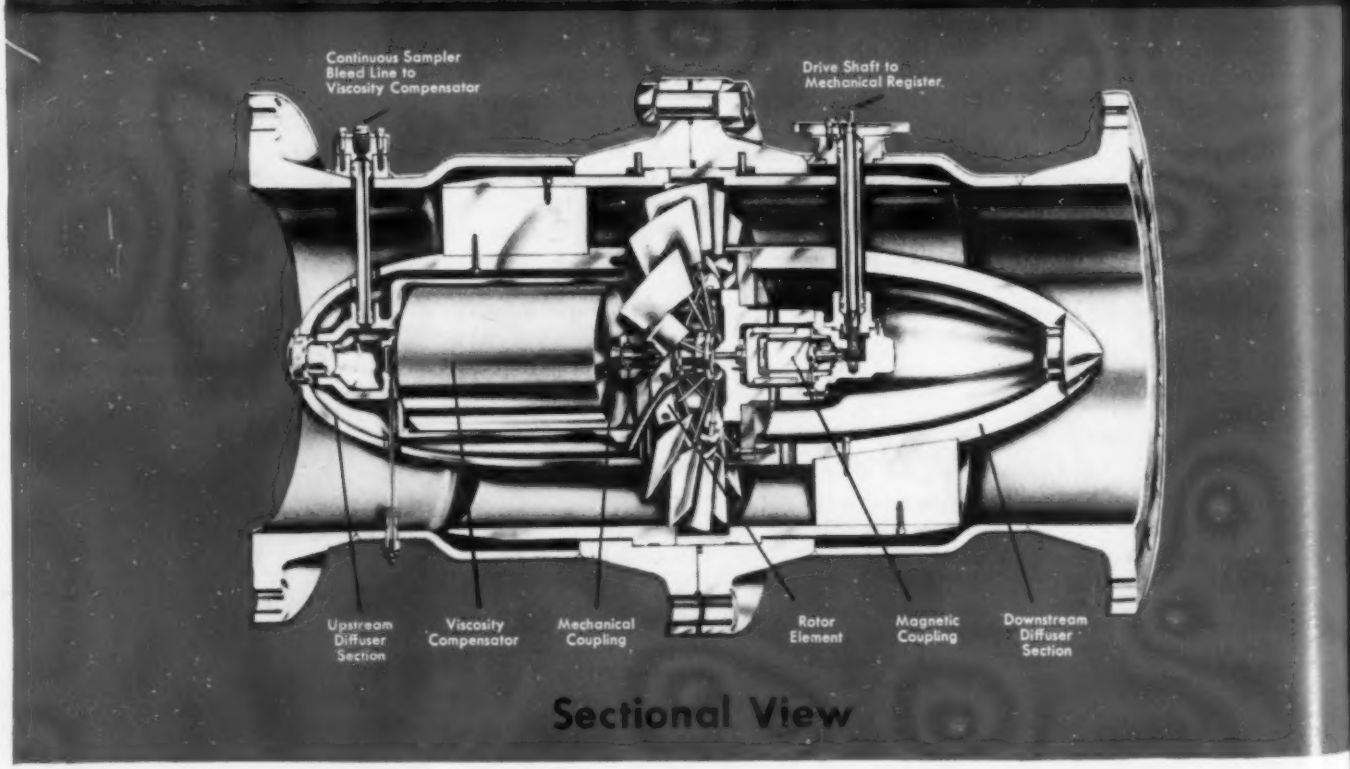
- ☐ BS&W Control with LIGHTNIN Mixers (B-503)
- ☐ Side-entering mixers, 1 to 25 hp (B-104)
- ☐ Data sheet for figuring mixer requirements (B-107)
- ☐ Condensed catalog describing LIGHTNIN Mixers—all types (B-109)
- ☐ LIGHTNIN rotary mechanical seals to eliminate stuffing-box maintenance (B-111)

MIXING EQUIPMENT Co., Inc., 196-n Mt. Read Blvd., Rochester 3, N.Y.

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 19, Ont.

In Europe: Lightnin Mixers, Ltd., Poynton, Cheshire, England





Sectional View

At 7000 bbls per hour they read this Rockwell Turbo-meter 600 miles away–

This Rockwell Turbo-meter is installed on a crude oil line in New Mexico. They read it in California through remote registration with ±0.15 per cent accuracy and repeatability of ±.015 per cent. In addition, an exclusive meter-driven mechanical register provides on-the-spot records for field operators, eliminating all possibility of loss of reading due to electrical failure.

This Turbo-meter measures accurately because only in the Rockwell design will you find a built-in viscosity compensator. The compensator automatically and continuously adjusts the meter for changes in temperature and density. Another exclusive advantage is the wide range of flows a Turbo-meter will handle accurately —all the way down to 20 per cent of maximum capacity. When desired, an impulse generator can be furnished so that measurement can be quickly verified on a ball or piston type fast prover without interrupting the flow.

Before you buy any turbine meter check the savings, the convenience, and all the engineering advances built into Rockwell Turbo-meters. See your jobber or write us. Rockwell Manufacturing Company, Dept. 125M, Pittsburgh 8, Pa. In Canada, Rockwell Manufacturing Company of Canada, Ltd., Box 420, Guelph, Ont.

TURBO-METERS

another fine product by

ROCKWELL

Stromberg-Carlson® Selective Tone Signaling

Through the use of transistorized tone signaling, this one-way selective system provides fast, efficient means of contacting and collecting data from field stations.

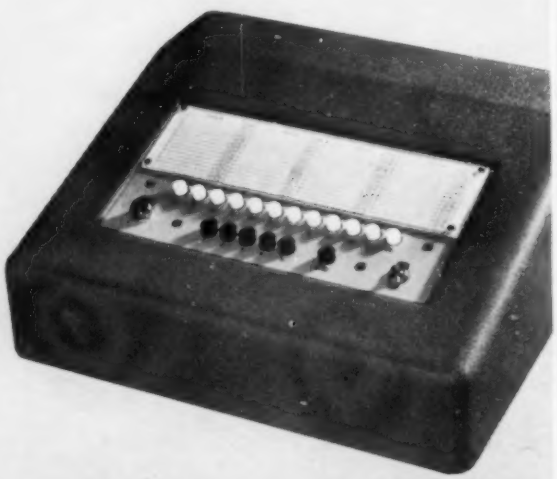
The operator can selectively signal any station (up to 60 in number) on the circuit. Continuous monitoring at the control point enables field communication points to report information at any time.

Stromberg-Carlson Selective Tone Signaling can be used on any facility: open wire lines, cable, carrier channels or radio circuits. The system can also remotely control such functions as VHF transmitters, signals, motors, etc.

For complete description of this high-efficiency tone-signaling system, write to Industrial Sales Department, 127 Carlson Road, Rochester 3, N. Y.

GENERAL DYNAMICS
TELECOMMUNICATION

Control equipment is enclosed in this sloping-front console 6½" high x 14½" wide x 14½" deep. The 12 white keys select carrier frequency. Five black keys select ringing frequency. Red key transmits tone signal to actuate selector receiver at desired station.



SYSTEM SPECIFICATIONS:

POWER: 48V D.C., approximately 65 milliamperes

TRANSMITTED POWER: +1 DBM

WEIGHT: approximately 20 lbs. each unit

CAPACITY: up to 60 stations

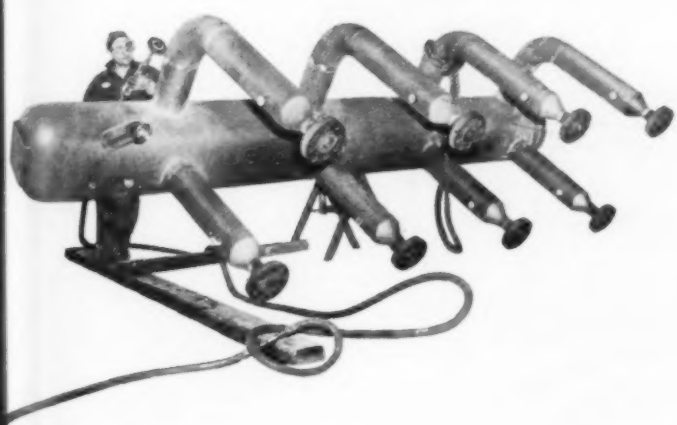
ATTENUATION: 30 db at ringing carrier frequency

RINGING FREQUENCIES: 20, 30, 42, 54 and 66 cycles

CARRIER FREQUENCIES: 525, 675, 825, 975, 1125, 1275, 1425, 1575, 1725, 2025 and 2175 cps. All carrier frequencies are within the voice band.

Compressor Headers by Midwest

Fabricated to your specification ...extruded or welded design...in any weldable metal



These compressor headers, fabricated for United Fuel Gas Company's compressor station at Coco, W. Va., are typical of the precision and quality of Midwest workmanship.

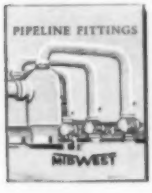
Upper header, formed of 24" O. D. x 1¾" thick rolled and welded Grade B carbon steel plate, has eight 8" extruded outlets reducing to 3" 1500 lb. flanged ends, and one 8" and one 3" full-size flanged outlets.

Lower header, of same diameter and wall thickness, contains eight 8" extruded outlets reducing to 3" 1500 lb. flanged ends, one 4" outlet, plus a 24" x 6" extruded cap.

This station, operating at 2000 lb. pressure, comprises five 880 HP and one 1100 HP gas engine compressors.

Midwest can produce headers to your exact specifications, in either welded or extruded type, and will gladly offer assistance on manufacturing and metallurgical problems.

New 36-page brochure, PIPELINE FITTINGS, describes Midwest fittings and fabricated piping for pipelines. FREE!



MIDWEST PIPING A Division of Crane Co.

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DEWSCOPE

from UGC INSTRUMENTS... Dew point readings can now be made accurately, positively and fast with the UGCI DEWSCOPE. No more eye-shifting, no more guessing and no more broken glass stem thermometers! There is no glass stem thermometer on the DEWSCOPE. Temperature is read directly off a meter having a thermistor sensing element that senses only the mirror temperature. A pointer stop has been provided to hold the temperature reading and the range scales can be read at a glance. Faster readings are made with the DEWSCOPE because of its cooling arrangement and the quicker response of the thermistor sensing element. Accuracy is also increased by the optical light source that gives clear distinction between hydrocarbon, water and other dew points. The DEWSCOPE is ruggedly built, requiring little maintenance. Compact in its self-cover carrying case, the DEWSCOPE gives accurate dew point readings fast.

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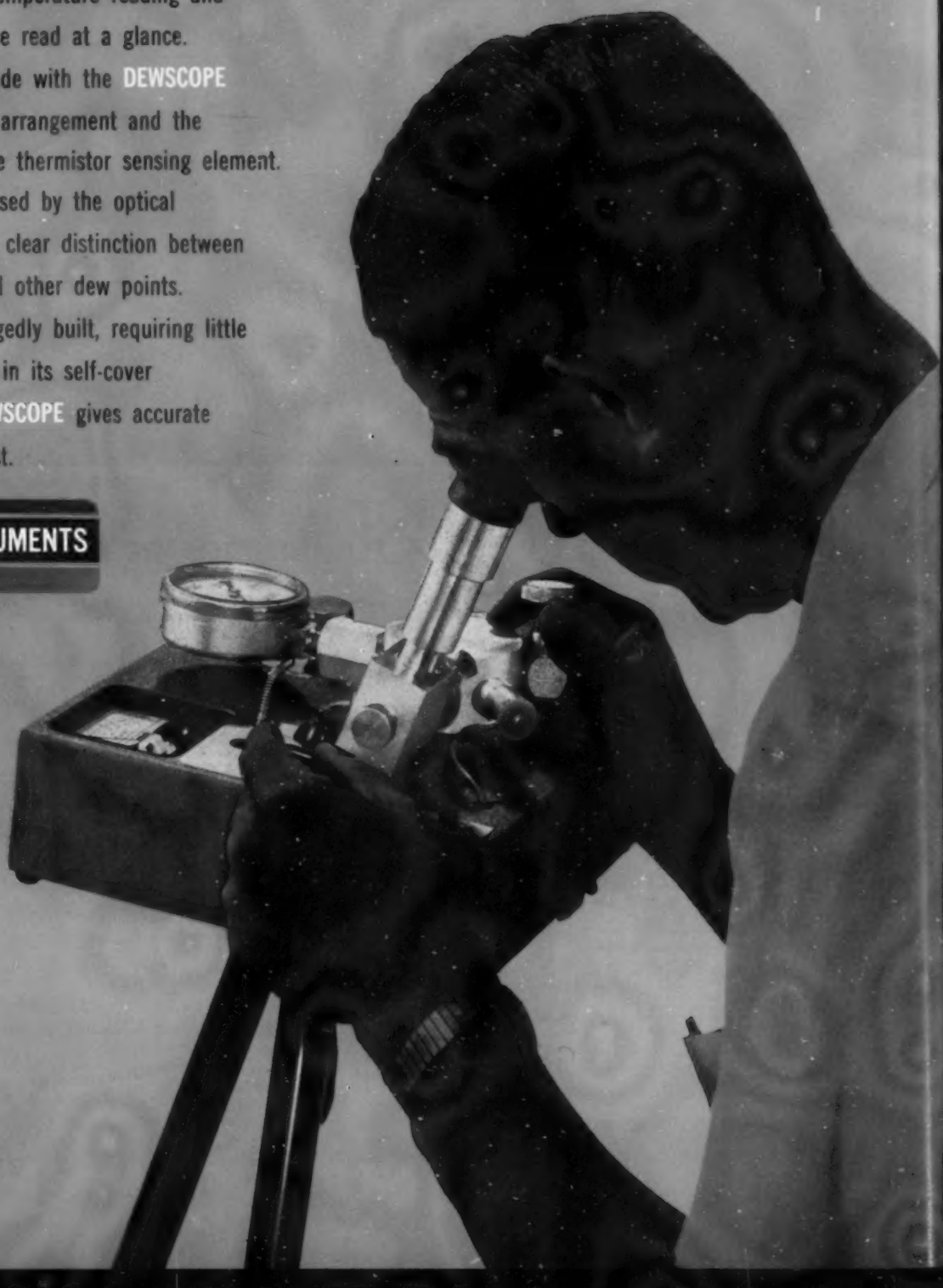


PIPE LINE PANORAMA

FPC Could Unleash Record Construction Year . . . Indicators that 1962 will be an active pipe line construction year: nearly $750 million worth of pipe line construction applications, representing 78 major projects, were pending before FPC at third quarter's end—up six applications over previous quarter.

Of total, 37 applications worth $337 million had been given full or in-part green light under temporary certificates. Remaining $410 million in pipe line projects were still hanging fire.

At October's end, more than 200 major and minor applications were pending. Mileage: 7,499. Estimated cost: $941 million.

Be sure to see the January issue of PLI for construction forecasts covering all major gas, oil and products pipe line operators in U.S. and the Free World. Figures will include pipe sizes, mileage, and pumping and compressor horsepower.

Producers Blame Problems on Interstate Lines . . . Johnny Mitchell, one of the vociferous Texas independent producers, laid these complaints before recent meeting of Petroleum Landmen's Association:

To maintain growth rate, and avoid escalation problems—FPC review, some interstate pipe lines are stooping to "highly questionable, unethical and possibly illegal practices," i.e., obtaining short term contracts with small gathering companies on pay or take basis—formation of intrastate lines to tie up and purchase town lot wells with limited or questionable reserves at lesser price than area rate paid by interstate competitors—commingling of interstate and intrastate gas reserves through purchases of reserve gas, unreserve gas and intrastate gas for same pipe line system.

As Mitchell puts it, if the industry doesn't seriously consider these problems and work for sound solutions, those responsible shall be faced with undesirable publicity, possibly increased controls, and premature depletion of gas reserves potential.

Question: doesn't it take two to make the deals mentioned? Why should onus land on pipe lines any more than producers?

Texas Eastern Shows Innovations in Remote Control Facilities . . . Technical writers were taken on highly informative tour of Texas Eastern operations early in December. Highlights:

The Company's first 15,000 horsepower electric synchronous prime mover to be installed without housing outside a compressor station (on 30-inch trunk line at Tompkinsville, Ky.), and first of its type to be operated by electronic controls (from division headquarters at Shreveport, La., nearly 600 miles away). Officials say new installation increases efficiency, reduces costs.

Writers also visited reciprocating station at Longview, Texas. It, too, is electronically controlled out of Shreveport.

Washington in 1962: not too promising . . . Unprecedented stumping tours in recent weeks by Kennedy men Joseph Swidler, John Kelly, Larry O'Connor, James Landis, et al, leave these impressions for the year ahead: no hope for producers to be freed from natural gas regulation—most thorough report on nation's energy supply and demand ever written will be made by National Fuels Policy Study Committee about February 1—Under pressure from State Department, Interior Secretary Udall's new mandatory imports quota will reduce crude influx a piddling 50,000 bpd, irking producers, importers—and exporters alike—A Federal Power Commission with bigger staff, fatter budget is on the way—Handling of pipe line construction applications will be speeded, but federal controls will be stiffened.

IRAQ Laying twin 32-inch crude lines in the Arabian Gulf (left), Brown & Root, Inc., used giant lay-barge L. E. Minor. From the kickoff point, near Fao, Iraq, pipe is pushed off barge and onto the buoyancy control pontoon, which allows heavy concrete-coated pipe to submerge gradually. Line extends 25 miles into Gulf to a deep water terminal now being built for Basrah Petroleum Company. Right is one of the four twin 12-inch tanker loading units to be installed at the terminal.

International Pipelining

Construction Is Booming Arou

More than 5,500 miles of line in 1961 and an investment

By Donald G. De Pugh
Construction Editor
PIPE LINE INDUSTRY

INTERNATIONAL PIPELINING is big business, and it's getting bigger every year. Significant projects completed or undertaken in 1961 amount to more than 5,500 miles of pipe lines and represent $400 million plus in capital investment.

In 1961 the French added two more major lines to their Sahara complex and are working on a third one. The National Iranian Oil Company completed a 515-mile products system and its first gas line. Esso Standard went to work in Libya laying the first pipe line in that country and already another is underway.

First stage of India's 720-mile crude line is nearing finish and Italy's ENI oil entrepreneur, E. Mattei, is laying a crude line system from Genoa to Switzerland and Germany. Other major lines were constructed in Argentina, Canada, Mexico, Iraq, and France, where the world's biggest crude line is now under construction.

Here's a report on these projects by countries.

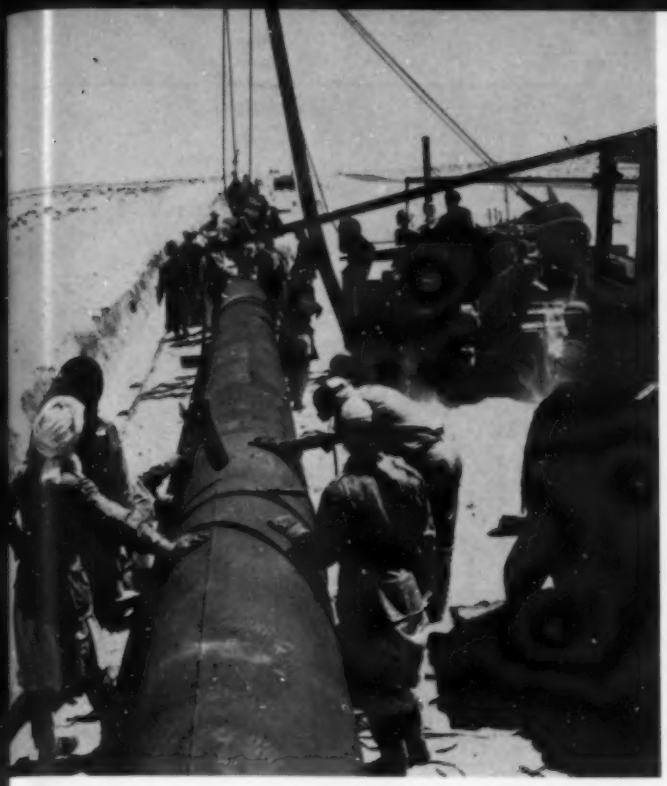
IRAQ

Iraq's major pipe line project in 1961 was construction of twin 25-mile, 32-inch crude lines which extended from Fao 25 miles into the Arabian Gulf where a terminal for tankers was built.

Brown & Root, Inc., is laying the 25-mile lines for Basrah Petroleum Company. Brown & Root employed its large lay-barge, the L. E. Minor to build the system.

The deep water terminal, capable of handling supertankers, consists of a main central island, 400 feet long and 230 feet wide, from which all loading operations are controlled, and two smaller structures linked to the main platform by bridges.

Automatic Loading Facilities. Four oil loading units, each comprising two 12-inch loading lines, are positioned on the center platform, two for each



LIBYA Arabian Bechtel Corp. pipe gang (left) makes line-up and stringer bead weld on Libya's first pipe line, a 110-mile, 30-inch crude line from Zelten to Marsa El Brega. At the Mediterranean port of Marsa El Brega, Esso Standard Libya is building a crude loading terminal to accommodate large tankers. The bow mooring structure (right) will handle crude from 42-inch offshore line and load tankers 86,000 dwt and up through pipes in middle of structure. Loading rate is 50,000 bph.

ume World

nent 00-million-plus

of the two berths. Loading capacity of each berth is 7,000 tons an hour. Each unit has an automatic luffing device which provides unattended loading operations.

The main crude line transfer pipes comprise a 20-inch riser within the main column (see accompanying photo). It bifurcates into two 14-inch tubes forming the outer lower membrane of the boom and converging at the head of the boom. These connect with the 12-inch loading hoses which are 45 feet long. Loading units operate in pairs from a control point located 40 feet above jetty deck level.

LIBYA

Six years after the Libyan government enacted its petroleum law in 1955 providing incentive for companies to explore for oil, the country's first pipe line has been constructed. Esso Standard Libya, Inc., completed its 110-mile, 30-inch crude system from the rich Zelten field to Marsa El Brega, a port on the Mediterranean Gulf of Sirte.

Pipe delivery to Libya was begun in the summer of 1960 and Esso engineers devised a new method for unloading pipe in the Gulf, by floating the joints to shore. (PIPE LINE INDUSTRY January 1961, Page 30)

Arabian Bechtel Corporation was awarded the contract to construct the pipe line and a black top highway paralleling it. Before actual pipe line work was started, mine-detectors had to be employed to detect and destroy unexploded shell and grenades as well as land mines which were deposited during World War II. Early in February a severe storm, bringing heavy rains and gales which disrupted communications and power supplies, halted construction activity. After recovering from the storm and training local labor for welders and equipment operators, Bechtel began laying pipe late in February and completed construction in August.

The entire line received a 25-mil coating of butyl rubber polyvinyl chloride tape with an asphalt felt wrap for corrosion protection. A radiotelephone communications system linking Marsa El Brega, Zelten and Benghazi has been installed.

In addition to the crude line, Esso installed a large gas-oil separation plant at Zelten with a capacity of 160,000 barrels daily. From the separation plant, crude is pumped over an escarpment about 20 miles. From there it flows by gravity to the port.

Loading Facilities. At Marsa El Brega, Esso is building a terminal and loading facilities to handle large tankers. Four floating roof storage tanks, 268,000-barrel capacity each, have been constructed. From the tanks, oil flows by gravity to the meter battery through a 3-mile, 48-inch line; it then flows about 1½ miles through a 42-inch submarine line to the bow mooring and loading structure offshore. Five positive displacement meters handle 50,000 barrels per hour which is the rate for the loading system.

The bow mooring device is 148 feet high, with less than 50 feet ex-

ARGENTINA Techint, Inc., welders make progress on Esso Argentina, Inc., 390-mile 14-inch crude line from Challaco to Puerto Rosales.

ALGERIA The 323-mile Ohanet-to-Messaoud 30-inch crude line is complete; 30-mile, 24-inch extension will connect with Edjele-La Skhirra line.

tending above water. Tankers of 86,000 dwt or more will be able to moor from the bow, enabling a tanker to swing in a full 360-degree circle without interruption of loading. Crude will flow up through pipes in the middle of the structure and into the tanker.

Contractors on the project include Arabian Bechtel, Chicago Bridge, Ltd., Crow-Steers & Shepard, Al Oumran, Mahdi Bettamer a Benghasi electrical contractor, Consolidated Contracting Company, Libyan Engineering and Contractor Company, Oilfield Contractors, Inc., and Contracting and Trading Company of Libya. Engineering firms involved were Kelvin Hughes, Ltd., Frederick R. Harris Company and Brown and Root Overseas, Ltd.

Under Construction. Libya's second major crude pipe line now is under construction. The Sidrah Pipeline System will extend from the Dahra and Maruk fields in eastern Tripolitania to Es Sider of the Gulf of Sirte. It will consist of 90 miles of 30-inch, and 40 miles of 20-inch.

Sidrah Pipeline is owned by Amerada Petroleum Corp. of Libya, Continental Oil Company of Libya, Ohio Oil International of Libya, Inc., Esso Sirte, Inc., W. R. Grace and Company and Libyan American Oil Company. The Oasis Oil Company of Libya, owned by Amerada, Ohio and Continental, will operate the line.

The line is being built by Libyan Engineering and Construction Co. and Arabian Bechtel Corporation. The 30-inch section will run from Dahra to Es Sider and the 20-inch segment will link the Mabruk fields with the main line. With a capacity of 300,000 barrels per day, the line will deliver crude to the Es Sider terminal by gravity. Plans include installation of an automatic control system to operate the line and loading terminal.

Libyan plans for 1962 call for construction of a 50-mile, 20-inch crude line from Raguba field to Zelten to be built by Esso Sirte.

ARGENTINA

Esso Argentina, Inc., financed and constructed a 390-mile, 14-inch crude line from Challaco in the Neuquen area to Puerto Rosales for the government oil agency, Yacimientos Ficales Petroleos. The line was constructed by Techint, Inc.

MEXICO

Petroleos Mexicanos completed construction of its gas and products lines from Monterrey to Torreon and is extending both lines to Chihuahua. See article on Page 56 for details.

ALGERIA

This past summer, Compagnie d' Exploitation Petroliere (CEP) completed Algeria's third major crude line. This was a 323-mile, 30-inch system linking the vast Ohanet field with Hassi Messaoud and tying into the 470-mile Messaoud to Bougie 24-inch line which was built in 1959. Ohanet is located about 50 miles from Edjele field, from which the French constructed a 485-mile, 24-inch crude line to La Skhirra, Tunisia, last year.

Earlier this year, CEP and Mobil International decided to lay the Ohanet to Messaoud line with the possibility of extending it to Edjele, giving the French an outlet through Algeria for all its Saharan oil. Pres-

IRAN **Williams Brothers Company completed Iran's 520-mile, 8-inch products system from Teheran to Meshad, building the final 270 miles in 1961. Iran put into operation a gas line, two products lines and added several pump horsepower on its Trans-Iranian crude system this year.**

ently CREPS is adding the 30-mile, 24-inch pipe line connecting Ohanet with the Edjele line which will allow it to take oil from Edjele to Hassi Messaoud and on to Bougie and bypass Tunisia, where the French are having political problems. The La Skhirra line has been closed since the flareup over Bizerte.

Gravity Flow. From Ohanet, crude flows by gravity to the terminal at Messaoud. Therefore no pumping stations were required on this major construction project. The line was started in January and welding was completed in June with testing finished in July.

Contractors GREP and SOCOMAN laid the Sahara's biggest system through the desert. The terrain included over 210 miles of sand and dunes, some 84 of them through the Grand Erg, and about 110 miles through rocks.

Pipe for the line was API 5Lx X52, 30-inch diameter with a 9/32-inch wall thickness. One double jointing yard was set-up for welding. Gathering and treating facilities for the $30 million project also have been completed. Omnium Technique Des Transports Par Pipe-Lines (OTP) handled engineering design of the system.

CREPS is laying a 30-mile, 24-inch line to link the Edjele-La Skhirra line with Ohanet and plans to have it operating by the first of the year. The $3 million line will allow CREPS to transport about 60,000 barrels daily through the new system. CREPS had been delivering approximately 150,000 barrels through its main line.

Other lines completed by French-Algerian companies in 1961 included a 185-mile, 8-inch condensate line connecting Hassi R'Mel gas field with Hassi Messaoud and a 70-mile lateral from Messaoud to Hassi-El-Gassi oil field.

IRAN

Several important developments in Iranian pipe line were completed in 1961. National Iranian Oil Company completed the 515-mile, 8-inch products pipe line from Tehran to Meshed. Williams Brothers Company began construction of this system in 1960 and completed it last summer. Also a gas line was constructed from Gach Saran to Shiraz. The 170-mile, 10-inch line, which will have a capacity of 20 MMcf of gas per day, was laid by Constructors John Brown Limited.

NIOC put into operation its new products line from Tehran to Qazvin, a 100-mile, 6-inch line which now is being extended to Resht. Eight pump stations were added to the Trans Iranian system which stretches from Abadan to Tehran.

On the Shahroud-Meshad line, NIOC used API 5LX 42 pipe with 0.219 and 0.250 w.t. The 8-inch system is buried along the entire route with a minimum cover of 18 inches. Casings were used at all rail and road crossings. The line also will receive cathodic protection.

Unattended Station. Pump stations are located at Ray, Semnan and Shahroud. A fourth station is planned at a point 170 miles from Shahroud, but will not be installed until 1967. Construction on the Shahroud station has been completed and the Rey and Semnan units will go on stream late in 1962. Until then, an existing unit at Rey on the Rey-Resht line will be used on this system.

Three electric driven pumps will be installed in series at Rey and the station will be designed with start-up sequence remotely controlled. Semnan will be an unattended booster station. Local push-button start-up and se-

CANADA A 9,200-hp turbine is being installed at Portage La Prairie, Man., station on Trans-Canada Pipe Lines Limited system. This is part of 51,000-hp expansion program in 1961.

quence control is planned at Semnan. NIOC plans to start-up this station remotely from Rey when communications between Rey, Semnan and Shahroud are installed.

A single engine and pump will be installed at this booster station with plans for adding another when needed. The Shahroud station has three diesel engine driven series pumps. It will be an attended station.

Capacity of the line will be 120,000 barrels at Shahroud and 154,000 barrels at the Meshed terminal.

CANADA

Taking part in building the world's largest gas pipe line system. Alberta Gas Trunk Line Company and Alberta Natural Gas Company completed 635 miles of 12—36-inch gas main lines and laterals in Alberta and British Columbia. The Canadian system ties into Pacific Gas Transmission Company and Pacific Gas and Electric's 900-mile, 36-inch line from British Columbia to San Francisco. See Page 52 for detailed article on this pipe line.

Crude Lines. A 515-mile, 12-inch crude line is being built by Westcoast Transmission Company's subsidiary, Western Pacific Products & Crude Oil Pipe Lines Ltd. It parallels Westcoast's gas line extending from Taylor to Kamloops, British Columbia.

The $30 million system will have a capacity of 75,000 bpd and will tie into the Trans-Mountain Pipe Line system at Kamloops. Dutton-Williams Brothers Limited is constructing the 361-mile southern section of the line and Canadian Bechtel Limited is laying the 145-mile northern portion.

A crude line from Blueberry oil fields to Taylor, British Columbia which will supply crude to the Western Pacific line is underway. Pioneer Pipeline Contractors Ltd. is constructing the $2.5 million line for British Columbia Oil Transmission Company Ltd. The system consists of 66 miles of 8-inch trunk line and 11 miles of 4-inch gathering lines. Capacity will be 14,000 barrels daily.

Saratoga Processing Ltd. completed a 67-mile gathering system to deliver 50 MMcf of gas daily to Alberta Gas Trunk Line at Coleman, Alta., and Petrogas Processing Ltd., laid a 208-mile gathering system of 2—8-inch. Both jobs were constructed by Banister Construction Co. Limited.

Trans-Canada Pipe Lines Ltd., 1961 expansion program included installation of 51,000 additional compressor horsepower in seven stations. Biggest chunk of $8.6 million program goes into new turbine units. Five 9,200-horsepower turbines and two 2,500-horsepower reciprocating units are being added in 7 of the 18 stations along the 2,340-mile gas line from Alberta to Toronto.

INDIA

Construction was undertaken on the first stage of Oil India Private Limited's 720-mile, 14-16-inch crude line from Nahorkatiya in Upper Assam to Barauni in Bihar. The 270-mile, 16-inch section from Nahorkatiya to Nunmati is scheduled for completion by the end of the year. Burmah Oil Co. is handling construction of the line.

Mannesmann-Saipem Pipe Line Contractors, formed by German and Italian companies, have to lay the line through rugged terrain including rice fields, tea gardens, forest, hills, and swamps in addition to some 78 river crossings.

River Crossings. The line crosses the Brahmaputra River near Gauhati where it is nearly 5,000 feet wide. Burmah Oil engineers decided on a suspension bridge which would have a main span of 2,400 feet and two 1,200 foot spans. The crossing will be a single 14-inch line.

Nine other overhead crossings will be installed, 35 lines will be underwater crossings and some 33 will be installed across existing rail bridges.

Pipe for the 14-16-inch main line is API 5LX 46 with wall thickness of 0.312-inch. For station manifolds a 0.375-inch w.t. is used and for crossings 0.469-inch w.t. was required.

Valves. Forty two through conduit valves will be installed on the main

the world's largest crude line . . . turn the page

line. Some double disc gate valves are used in connecting line with tanks, filters and pumps. Station valves will be lubricated taper plug valves. Many of these will have electrical actuators.

Coating system on the $90 million line is a coal tar primer and enamel with a fiberglass inner wrap and an outer wrap consisting of a glass mat tissue impregnated with plasticized coal tar. The line will be cathodically protected using graphite anode groundbeds. Solus-Schall, Ltd., has contract for inspecting welds on the entire line.

Stations. Nine stations will be spaced along the line which will have a capacity of 2.7 million tons annually at Nunmati and 2 million tons at Barauni.

On the 16-inch section to Nunmati, four stations will be installed—at Nahorkatiya, Morgan and points between Morgan and Nunmati. At Nahorkatiya, three septuplex pumps, with dual fuel engines rated at 615 bhp at 460 rpm will comprise the initial station.

At Morgan, quintuplex pumps will be driven by dual fuel engines and at stations three and four diesel engines will be used on quintuplex pumps. All pumps are vertical single acting multi-plunger type pumps. Between Nunmati and Barauni, there will be three stations run by engine driven septuplex pumps.

Crude from the line will be treated and used for operating fuel.

Stations will be automatically operated and controlled from Gauhati. A VHF communications system is being installed to link pump stations, maintenance stations, corrosion stations, and mobile pipe line patrols with operations headquarters.

EGYPT

Three products pipe lines are being laid in Egypt with completion expected soon. A 75-mile 12-inch fuel oil line will extend from El Mex near Alexandria to Tanta. A 6-inch line, with a capacity of 500,000 tons per year, will move kerosine from El Mex to Kafr el Dawar. Another kerosine line, an 84-mile, 10-inch system, will extend from a refinery near Suez to Cairo, which will supply the Cairo airport.

ITALY

A 625-mile, 12-26-inch crude line system spreading from Genoa, Italy, through Switzerland and into Germany has been started by ENI, Italy's state oil company.

Forming the Oleoduc De L'Europe Centrale company, ENI started construction early this year on the Genoa to Ferrera to Aigle, Switzerland line. This is 26-inch to Ferrera and 12-18-inch to Aigle.

From Ferrera the line also will serve Cremona and Piacenza, Italy. Plans call for laying a 24-inch line from Ferrera into Switzerland at Ponte Stressa extending to Grisons and St. Gallen near Austria. Cutting through the northwest section of Austria, it would enter Germany at Lindau and proceed to Ulm. From Ulm, two 18-inch lines will be constructed—one to Ingolstadt and the other to Stuttgart.

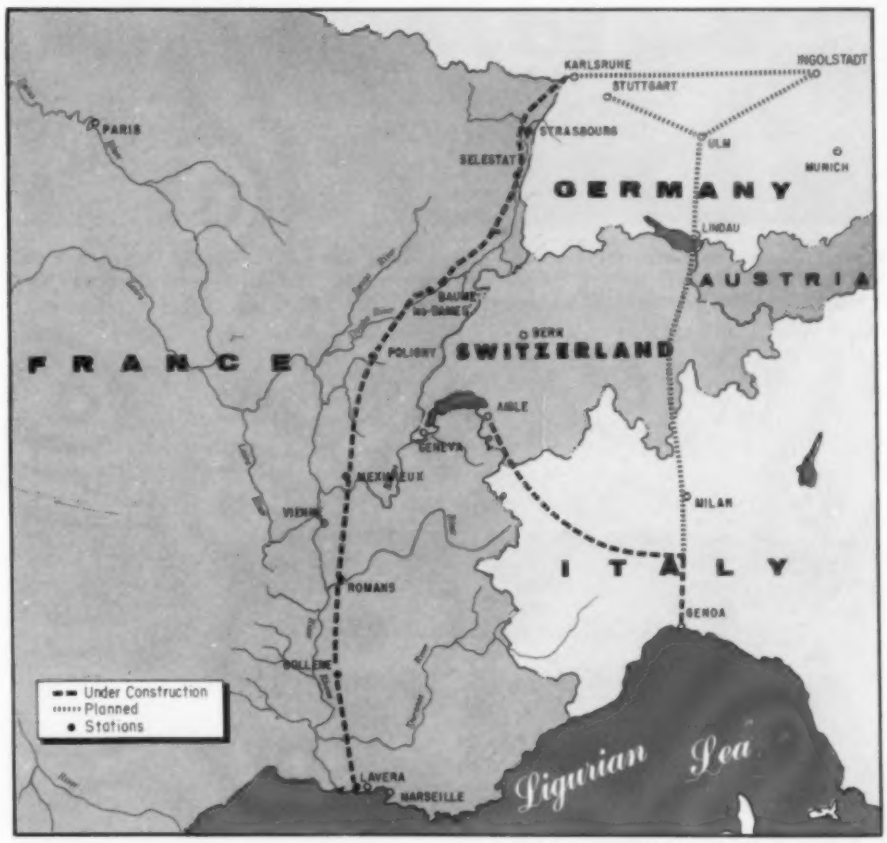
Three pump stations will be installed on the Genoa to Aigle line. Contractor Saipem, ENI's subsidiary, will have rough sledding laying this line through the Alps. It will pass through the 3.3-mile, Great St. Bernard tunnel which is 6,000 feet above sea level. Also some 50 miles of tunnels will have to be constructed to get through the mountain range north of Genoa.

The extension into Austria will be laid through the St. Bernadrino Pass which is 4 miles long and 5,200 feet high.

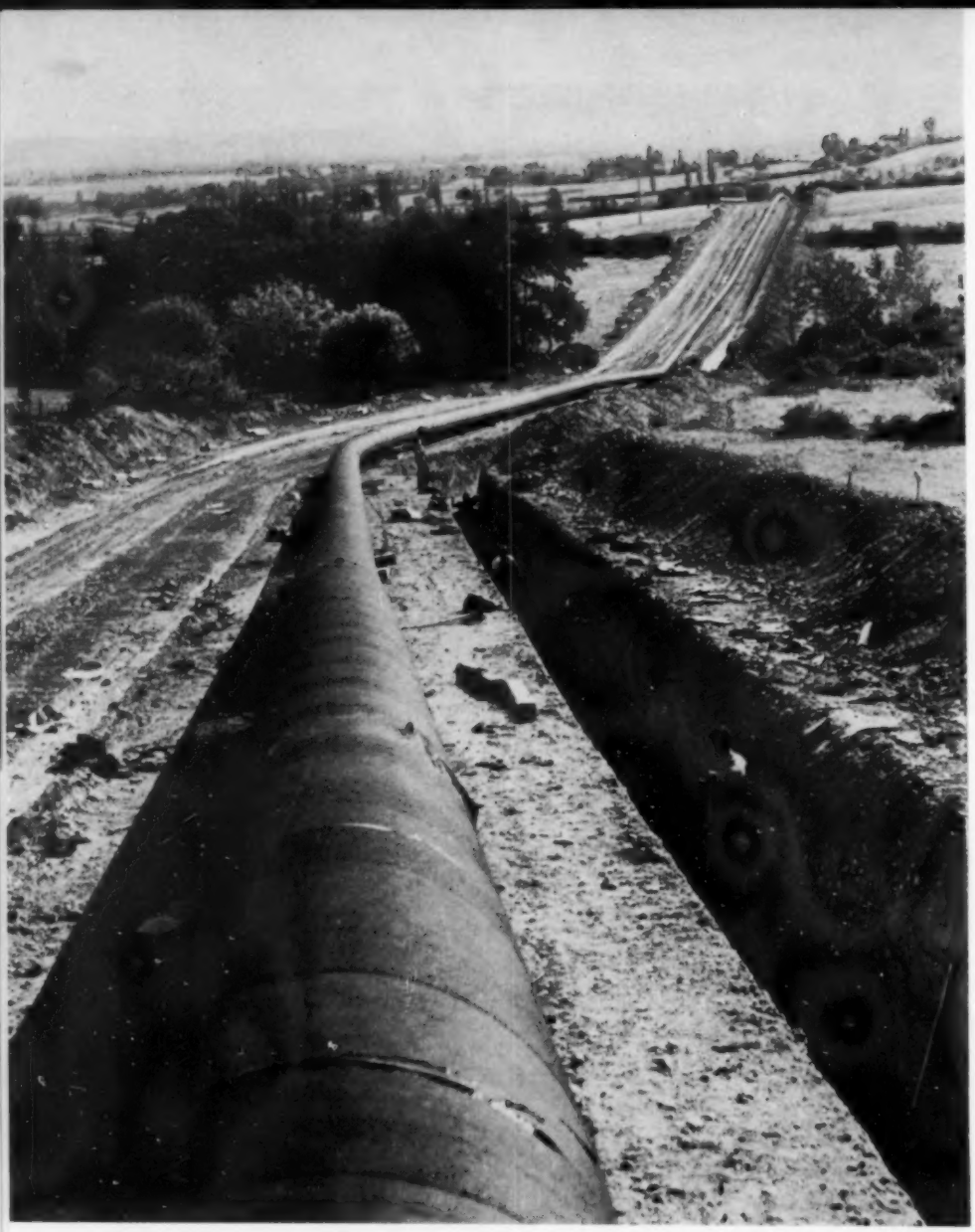
This $8½ million system is scheduled for completion in 1963.

FRANCE

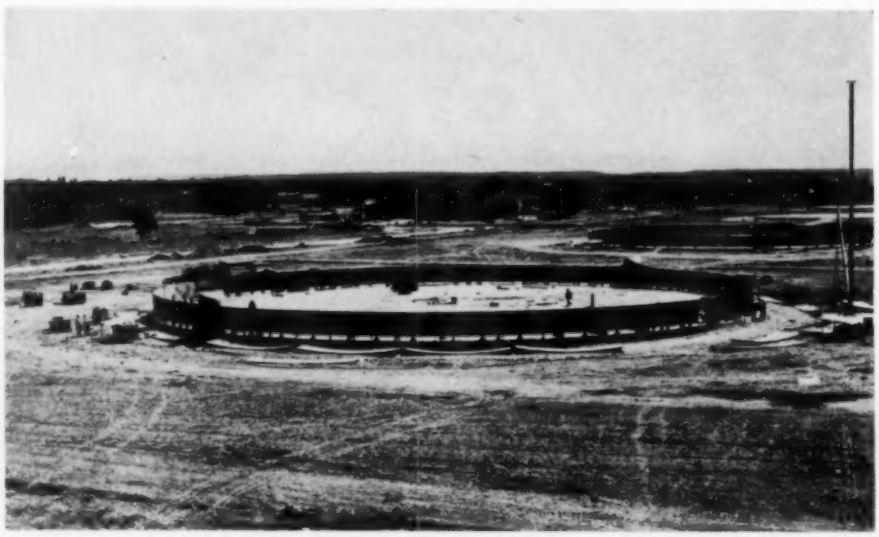
Societe du Pipe-Line Sud-Europeen is building the world's biggest crude line, a 472-mile, 34-inch system to stretch across France from Lavera to Strasbourg and into Germany stopping at Karlsruhe. See Page 50.



EUROPE ENI, Italian state oil company, is building a crude system which includes line from Genoa to Aigle, Switzerland. Plans call for lines to Stuttgart and Ingolstadt, Germany, to be built by 1963. South European line is being built from Lavera in France to Karlsruhe in Germany. Karlsruhe-to-Ingolstadt is planned for 1963.



Biggest crude line under construction. This 34-inch line will be Europe's largest crude carrier. It will initially deliver 200,000 barrels per day with three pump stations. With seven stations the capacity will be about 600,000 barrels per day.



Construction of the gigantic tank farm at Fenouillere near Lavera. The capacity of the farm will be 1,200 million liters or about 7.5 million barrels.

International Pipelining

The World's Largest Crude Line Will Supply Refineries in France and Germany

472-mile 34-inch line will benefit both countries

CONSTRUCTION of Europe's largest crude line, the South European Pipe Line, is on schedule. Work on the 472-mile 34-inch carrier started early this year and if all goes well the line will begin operations late in 1962.

The $120-million line will run from Lavéra, a port city on the Mediterranean near Marseille, across France to Karlsruhe in West Germany. The route parallels the Rhone and Rhine rivers, skirting the foothills of the Alps. Initially, the system will have a capacity of 200,000 barrels of crude per day, operating with three 2,500-hp pump stations. With the addition of four more stations and more horsepower, the daily deliveries can be upped to about 600,000 barrels per day.

The South European line will transport crude received from North Africa and the Middle East from the Mediterranean port to the refining area at the Franco-German border. French officials are hoping that at least 75 percent of the crude will come from the Sahara.

The tankers will discharge the

crude at the oil harbor of Fos-sur-Mer, about seven miles from the large tank farm under construction in Lavéra. Capacity of the farm will be about 1,200 million liters which is 12 to 15 days crude oil supply. A 7-mile-long, 34-inch line will link the harbor and the tank farm.

Initially, four inland refineries located near the Franco-German border will feed from the line. Two of them will be located near Strasbourg. Shell-Caltex-Mobil group is building one; and Campagnie Francaise Raffinage —Compagnie Francaise des Petroles—Antar Petroles de l'Atlantique-B.P. is constructing the other. For the 40-mile run from Strasbourg to Karlsruhe, the diameter of the line will be reduced to 32 inches if original plans are followed.

Two more refineries are being constructed at Karlsruhe. One will be owned by Esso AG; the other will be owned by a group of German companies. Additional refineries and petrochemical units are being planned for Bavaria.

This project is a joint venture of 16 different companies and it will be administered by Societe du Pipe-Line Sud-European (SPLSE). Bechtel International and Omnium Technique des Transports par Pipe-Lines (OTP) are responsible for the engineering design of the complete line, the initial three electric-driven 2500-hp pump stations and the tank farm at Lavéra. Moreover, OTP and Bechtel are managing the construction for SPLSE.

The joint owners of the line are: Antar Petroles de l'Atlantique, Bataafse Petroleum Mattschappij, N.V. Compagnie de Raffinage Shell Berre, Compagnie Francaise des Petroles, Compagnie Francaise de Raffinage, Deutsche Erdol Aktiengesellschaft and Gelsenberg Benzin A.G.

Also Mobil Oil A.G. in Deutschland, Mobil Oil Francaise, Petrofina S.A., Scholven Chemie Aktiengesellschaft, Societie Francaise des Petroles B.P., Standard Oil Co. (New Jersey), The British Petroleum Co. Ltd., Union Industrielle des Petroles, and Wintershall Aktiengesellschaft.

Ditching through French countryside. Pipe line techniques in France are similar to those of the U.S. The 34-inch line will have 24 inches of cover; it will be coated and wrapped and cathodically protected.

Rhine-Danube Line. Recently, a group of petroleum companies announced that a 26-inch extension to the line will be laid from Karlsruhe 180 miles through Germany's Black Forest to Ingolstadt on the Danube in Bavaria. The new line will be called the Rhein-Donau Oelleitung—of the Rhine-Danube oil pipeline. Its capacity will be 160,000 barrels per day. It will be used to deliver oil to new refineries in the Ingolstadt area.

Bechtel and Phoenix Rheinrohr International will serve as engineer-manager of the project. The responsibilities will include design, engineering, acquisition of rights of way, procurement of materials and supervision of construction.

Negotiation for rights of way from the 20,000 land owners began in August. Construction is scheduled to commence early in 1963.

Unusual Features. One of the unusual features of the design of the South European line is the crossing of the Durance River—one of the tributaries of the Rhone. The Durance is an unstable river that meanders widely in its bed. Underlying the top soil is a marl (known as "safre") which has a high silica content. On contact with air it crumbles badly, making ditching difficult to maintain.

To solve this problem, the French have drilled two access wells (vertical shafts) some 90 feet deep and about 2,300 feet apart. Crews are boring toward one another from opposite sides of the river, concreting the tunnel as they go. The line will thus syphon beneath the river.

Difficulties in sinking one of the shafts were solved by using drilling mud chemicals to insure stability of the soil.

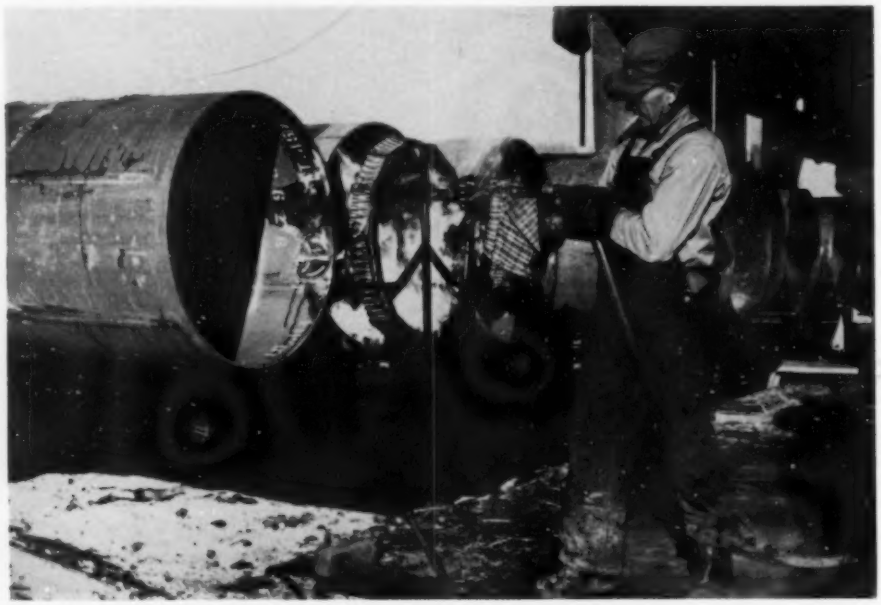
The South European line will do much to create a mutual trust between nations in the future. The line will be in a position to supply at least one half of Switzerland's needs and perhaps one third of Germany's needs. The rest of its capacity will be diverted to France's growing refining and petrochemical industry.

—**The End**

Canadian

It isn't . . . but contractors did clearing, grading, pipe double-jointing, stringing and river and road crossing work through the winter. 40 below zero and 20 feet of snowfall is not unusual in the Canadian Rockies.

Building a corduroy road through muskeg country on northern end of system in Alberta, an alligator lays rip-rap before pipe stringing begins. Rip-rap allows heavy equipment to travel over muskeg and served as insulator over soil to slow thawing in the spring.



Pre-heating of X-52 pipe was necessary on Alberta work in winter months. At Dutton-Williams Peers, Alta., plant, 30-inch pipe ends are preheated prior to double jointing.

When the thaws came, the bottom dropped out on Alberta Consolidated Pipe Line Builders' spread on Schedule II. This was typical of conditions through the Sarcee Indian Reservation in mid-May. Track equipment was about the only way to move along the r-o-w; note Bombardier track vehicle at right.

By Melvin A. Judah, Editor

PROBARLY ONE OF THE MOST ACTIVE pipe line construction areas this past year has been western Alberta and southeast British Columbia. It is beautiful country but if there is tougher terrain for pipelining you will have to prove both points to the Canadian contractors. Eight of them took part in laying the six schedules in Alberta and one section in British Columbia; they kicked off field work in late fall last year and continued right of way work, double jointing, river and road crossing plus some pipelaying through the winter. (For details on the complete Alberta-to-California system see PIPE LINE INDUSTRY, October page 36-46.)

Contractors. This was the first major pipe line job in Canada to award contracts in the fall and to carry out extensive winter work. There were six schedules in the Alberta Gas Trunk Line Company system and one in Alberta Natural Gas Company main line work across British Columbia.

Alberta Natural

• Price-Poole, a joint venture of H. C. Price of Canada, Ltd. and Poole Construction Co. Ltd. had the contract for the 107 miles of work on ANG's British Columbia line.

Lake Mountain-Winter Pipelining Look Easy

• Mannix Company, Ltd. laid the eastern 20 mile section of the B. C. and had the pressure testing contract for both the Alberta and B. C. sections.

Alberta Gas Trunk

• Majestic Contractors Limited laid the 111 miles of 36-inch in Schedule I from the B. C. border to Priddis, Alta., just southwest of Calgary. Majestic also completed Schedule III which consisted of 63 miles of 30-inch and the 38 mile, 22-inch Westerose South lateral.

• Alberta Consolidated Pipe Line Builders—a joint venture of Mannix, Piggott Construction Limited, Banister Construction Co., Ltd., and Marine Pipeline and Dredging, Ltd.—laid the 112 miles of 36-inch mainline in Schedule II between Priddis and just north of Codner, Alta. and the 63-mile, 16-inch Montana lateral, Schedule V.

• Dutton-Williams Brothers, Ltd., was the contractor on Schedule IV made up of 63 miles of 30-inch main line and the 18-mile, 22-inch Windfall lateral.

• Henuset Brothers, Ltd., completed laterals in Schedule VI; these consisted of the East Calgary, Wildcat Hills, Crossfield and Minnehik-Buck Lake laterals involving 24 miles of 22-inch, 21 miles of 16-inch and 12½ miles of 12-inch pipe line.

Advance winter work paid off for the contractors in high rates of pipelaying when spreads kicked off. Welding crews on Schedules I to V in Alberta completed 471 miles of construction some two months ahead of schedule. Extensive use of double jointing yards on all but a few miles was a big reason for the high rates of progress. To illustrate, in the extremely muddy right of way through the Sarcee Indian Reservation, Alberta Consolidated had to string single joints of pipe and made some seven miles in 15 days of the toughest kind of conditions. Upon reaching open, and drier land, the spread shifted to double joints and made 25 miles in 14 days of pipelaying. Single joints were also laid by Majestic in the rugged Livingstone Range and in the Crowsnest Pass area.

Weather Conditions. Much of the clearing and grading was completed during the winter months. It was a particularly good time to clear as the slash could be cut and burned with a minimum fire hazard. Some of the dense spruce and birch forest in west central Alberta intersected by the pipe line had very little merchantable lumber so the slash was either saved for rip-rap or burned. Cutting before the snow fall melted and soaked the wood made this a much easier task. Road bans were lifted for all but a few secondary highways by April for equipment hauling, however, early in the spring grading and the hauling of ditch padding materials was slowed somewhat by drifting snow. This work kicked off at a good pace in early May.

The Calgary area as well as other sections of Alberta had some unseasonable heavy snows late in April which delayed field operations. With the thaw, wet weather in the first half of May ruled out overload permits in some areas and slowed the movement of equipment. The "Fire Season" began at the end of May in the west central sections of Alberta. Contractors on Schedules III and IV had bulldozers commandeered for fire fighting purposes off of the right of way on occasion.

River Crossings. Much of the river crossing construction was completed during the winter to take advantage of ice support in some instances and to get the jump ahead of heavy spring run-off from the Rocky Mountain thaws in the Foothills watershed. All crossings were single underwater lines and were laid by the main line contractor.

Sometimes the ice layer on the rivers was an aid; at other times it hindered laying operations. On the North Saskatchewan, Majestic drilled shot holes with equipment working on a built up ice bridge. But on the McLeod River crossing some two feet of ice had to be broken-up to snake the river line across, and ice would freeze back almost as fast as the channel could be opened for the equipment to move the sheathed and weighted pipe line across. The Bow

Flex-float barge ferries sideboom across the North Saskatchewan River on Majestic spread in Alberta; unloading ramp is at left. A single 36-inch crossing was pulled from cut at right.

Most of the pipe on the Alberta and British Columbia work was double jointed at semi-automatic yards. Here two joints of 36-inch are unloaded at Price-Poole's Yahk, B. C. yard. Three such "portable" yards were utilized in B. C.; ten more yards double jointed pipe for the Alberta Gas Trunk work.

A dope chopping machine picks up drum of asphalt, chops it into three sections, discards chewed-up drum and drops chopped enamel into truck for hauling to right of way. In Alberta, coating and wrapping was over the ditch.

River, in a similar fashion, and the Red Deer were crossed by Alberta Consolidated; on Schedule I Majestic laid single crossings of the Oldman River and Crowsnest Creek.

In British Columbia, Price-Poole had one of the most difficult crossings on the entire Alberta to California system. Both banks of the Elk River were steep and rocky with the steepest having a drop of several hundred feet. The crossing was laid in late summer after the heavy run-off. Other crossings by Price-Poole in B. C. included one of the Kootenay and three of the Moyie River.

Record Progress. Contractors set a brisk pace of welding and pipelaying on spreads when good weather came in spring. June was the top month when some 216 miles of pipe line were welded up on Alberta spreads alone. Here is summary of progress by Schedule:

Majestic completed 110.7 miles of 36-inch in 65 working days averaging 9,000 feet per working day, and laying an average of 9,900 feet a day in June on Schedule I.

Alberta Consolidated made 106.3 miles of 36-inch in 55 work days averaging 10,200 feet per day; best day was 15,200 feet of pipe welded on Schedule II.

Majestic laid 63 miles of 30-inch in 30 working days for an average of 11,100 feet—having a record day of 17,800 feet of pipe in 10 hours work. On 38.3 miles of the Westerose South lateral Majestic averaged 8,800 feet in Schedule III also.

Dutton-Williams Brothers laid 63.1 miles of 30-inch in 33 working days for an average of 11,100 feet per day. On the Windfall lateral where a gravel-silt soil caused tractors to bog, even in high areas, progress was slowed to an average of 6,100 feet per day on the 18 mile, 22-inch lateral in Schedule IV. Much of the work of Schedule IV was through muskeg where it was necessary to probe to determine depth to a support layer and then build rip-rap roads. These roads provide access to the line after construction, also.

Alberta Consolidated, Schedule V, completed the 65 mile, 16-inch Montana lateral in 44 work days averaging some 7,800 feet a day.

Price-Poole's schedule between Kingsgate, B. C. and the Alberta-B. C. border had the most rugged country to cross of any of the spreads on the entire Canada-California system. It started in the Rockies, ended in the Rockies, and was steep and hard going most of the way between. Price-Poole averaged 6,400 feet per day and made 8,000 feet on its best day. The two toughest spots in this section were at Moyie Mountain which had steep 4 mile grades topping out at 6,600 feet. Farther east Price-Poole crossed the highest point on the line over 7,000 foot Flathead Ridge where tow tractors and winch-line holdbacks were a necessity. There are five river crossings in this section; three of the Moyie, the Kootenay, and the Elk rivers. And in this sparsely populated area there were only six railroad and highway crossings. Three of each were laid in the winter by open cuts when snowfall up to 20 feet had closed both rail and road traffic. Mannix completed the eastern 20 miles of this section as a subcontractor as the project neared completion.

Welding. Efficient use was made of mobile double jointing yards and this coupled with virtual year-round right of way work was the big reason for ahead of schedule progress on most spreads. Yards were set up at three locations in British Columbia—Yahk, Elko, and McGillivray—where pipe was double jointed with semi-automatic welding equipment and both the external protective system and the 2½-mil internal epoxy coating were applied. Ten yard locations were set up to double joint pipe in Alberta at Lundbreck, Nanton, Black Diamond, Jumping Pound, Cremona, Codner, Rocky Mountain House, Lodgepole, Cynthia and at Peers. Equipment was shifted as construction progressed.

Field welding of the double jointed pipe set good records on many schedules. On the Majestic and Alberta Consolidated 36-inch spreads stringer beads were run by four welders. Alberta Consol followed with six- hot pass welders; while Majestic used four welders on the hot-pass. Firing line on the Majestic spread normally had 24 welders.

Pipe Coating and Protection. The external protection for the pipe consisted of a 3/16-inch single coat and wrap system of asphalt primer, enamel, glass fiber inner wrap and 15 pound outer wrap of glass fiber impregnated with asphalt and mica. Potential "hot-spots" and river crossings were protected with a double coat and wrap system of these materials. British Columbia pipe was coated and wrapped at the double jointing yards;

On an inspection trip near the Livingstone Range are J. MacDougall, inspector, and B. W. Lee, resident engineer, Canadian Bechtel Ltd., accompany Eldon V. Hunt, general superintendent, and John M. Ballachey, assistant general manager of Alberta Gas Trunk Line Co.

Hydrostatic tests were made on completed sections of the Alberta-to-California line, except for short stretches of the line over steep mountains which were air-tested. Here an air compressor packs line in Alberta Gas Trunk Line section on the Livingstone Range in Alberta.

Alberta the protective system was applied over the ditch.

In rock country, specifications required that ditch padding and pipe shading material be placed around the pipe so that their was no rock or gravel material in the fill within four inches of the pipe in the ditch. Padding material was trucked in and stockpiled along the right of way to points where needed in the British Columbia work. Small dozers with a 42-inch blade smoothed the ditch bottom where practical. Majestic modified a ditching machine to obtain fine pipe shading materials by digging a waste ditch on Schedule I. The ditcher had grizzly bars above the conveyor belt which caught rocks and boulders and dropped them back in the waste ditch while the belt beneath carried the fines over to the ditch to shade the pipe line. Specifications called for a minimum cover of two feet in rock, and three feet in dirt or glacial till.

Clean-up gang on Alberta spread used this stone picker to clear right of way of small rocks and stones. Stone picker is pulled by tractor and unloads stones in dump truck to be hauled away.

Pressure Tests. The completed pipe line was pressure tested hydrostatically except for steep sections in the mountains; a four mile section over the Livingstone range was air tested. Mannix Company, Ltd. had the pressure testing contract on both the B. C. and Alberta work. A precise altimeter survey of the graded right of way was provided to the testing contractor. In British Columbia, the main line system was tested to 1,265 psi or to 100 percent of yield of the API 5LX-52 0.469 inch wall pipe. Specifications on the Alberta Gas Trunk Line called for a minimum pressure to produce 82 percent of yield strength of the pipe and a maximum of 95 percent of yield; actual squeeze pressures depended on diameter of pipe and wall thickness.

Compressor Stations. Only one Canadian compressor station will be used to move gas in the initial operation of the Alberta-California line. Station 1 near Crowsnest Pass in British Columbia was constructed by Marwell Construction Company Limited. It houses four KVH-12 four-cycle gas engines of 3,400 horsepower each driving integral reciprocating compressors. The station will be attended with local operation on dispatcher's set points from Spokane, Washington; however, engineering design provides for future automatic and remote control. Normal maximum operating pressure of the line is 911 psi.

Design of the Alberta Gas Trunk Line Foothills system provides for three future compressor stations on the southern segment of the main line.

Communications and Control. A microwave system is being built to provide a continuous link between San Francisco, Spokane, and Calgary. In addition, vehicles of key operating personnel will be equipped with mobile radios tied in with the microwave system. Operating data from metering and compressor stations will be telemetered to the Spokane dispatching center where it will be displayed continuously on digital panels. System operating data will be logged out hourly on an electric typewriter; equipment malfunctions will sound an alarm and inform dispatcher by fault lights.

Acknowledgement. Our special thanks to key personnel with Pacific Gas and Electric Co. and associated companies, to management of The Alberta Gas Trunk Line Company, to Canadian Bechtel Limited who furnished engineering-management services on these systems and to the contractors who supplied information for this report. (For more complete details on company organizations, contractors, engineering design personnel and equipment on the entire Alberta to California system see PIPE LINE INDUSTRY October, pages 36 to 46.) **The End**

"The Pinto" some 65 miles out of Monterrey where the 16-inch gas line and 10¾-inch products line climb 1,100 feet in a little over half a mile. Note the wearing sleeves at each sleeper.

Pemex Lays Gas and Products Lines to Torreón and Chihuahua

New ideas sparkle south-of-the-border construction

By Francisco X. Peredo
Superintendent of Pipeline Construction, Petroleos Mexicanos, Mexico City

PETROLEOS MEXICANOS has finished construction of parallel products and gas lines from Monterrey to Torreón in northern Mexico and construction is now under way to extend the two lines some 270 miles to Cd. Chihuahua capital of the State of Chihuahua.

Perhaps the two most unusual features of the construction of the new lines were the use of a river bed as right of way through the city of Monterrey and suspending the two lines above grade in rugged areas where conventional construction would have been almost prohibitive in cost.

Monterrey, a city of 680,000, has had natural gas since 1950. But in recent years, its enormous growth and fast-paced industrial growth has resulted in a scarcity of this important fuel. So Petroleos Mexicanos constructed a 22-inch gas line from Reynosa to Monterrey, placing it in service in early 1958. This line was to bring dry gas from the absorption plant in Reynosa to industries in the Monterrey area (particularly the AHMSA steel mill in Monclova), and later on, to the cities of Saltillo, Torreón, Gómez Palacio, Lerdo and Chihuahua.

The present capacity of the line from Reynosa to Monterrey, without compressor stations and with an initial pressure of 1,000 psi is 27 MMcfd.

During 1957, Pemex completed and placed in operation a petroleum products line between Tampico and Mon-

terrey. The source of these products is the refinery at Ciudad Madero, which has a capacity of 110,000 bpd of crude petroleum thruput.

The present capacity of the products line from Tampico to Monterrey, with only two pumping stations, one in Ciudad Madero, the other in Victoria, is 27,000 bpd of diesel oil or 31,000 bpd of gasoline.

With four pump stations, (2 existing and 2 additional), the line could deliver some 55,500 bpd of diesel or 67,500 bpd of gasoline.

The city of Monterrey has been well supplied with liquid products as well as natural gas since 1958. Liquid products are distributed from Monterrey to all points in northeast Mexico by railroad tank cars and tank trucks.

By the middle of 1959 all of the problems concerning the continuation of the two lines from Monterrey to Torreón had been resolved and construction was started. Field work was finished in late 1960.

New Products Line. This 10¾-inch line, which is 346 Kms. (216 miles) long, required 13,000 tons (14,400 short tons) of 0.219 wt pipe. All of it was API 5LX-42 seamless in 40-foot random lengths, manufactured in Veracruz, Mexico.

This line is designed to operate at a pressure of 1,200 psi and to transport up to 25,000 bpd of diesel oil or 32,500 bpd of gasoline, using two pumping stations with one located in Monterrey. At the beginning it will transport 15,000 bpd which is the present consumption in the zone surrounding the terminal at Gómez Palacio.

The products transported by this line are gasolines, kerosines and diesel oil.

The pump stations have two horizontal centrifugal pumps apiece, each with a capacity of 730 gpm. The power units are 12-cylinder natural gas engines of 650 bhp.

The line is divided into 16 sections by means of 13 section valves and 2 pig traps. All of the 10¾-inch valves were fabricated in Cerro Gordo, Mexico.

In general, the products line and the gas line follow the same route and right of way with the exception of the first 75 Kms. from Monterrey where the gas line followed a line previously constructed. The products line, however, had to traverse the city of Monterrey in order to avoid an excessive detour around to the south. A good portion of expensive construction through city streets was avoided by placing the products line in the bed of the Santa Catarina River. The pipe used in the 19 Kms. of river bed construction was ½-inch wall thickness, coated with a 1-inch thickness of concrete, and buried to a depth of 7 feet. This solution was considered most feasible since the river follows a reasonably direct route through the city from east to west, stays dry the greatest part of the year, and has a very stable course, being in the form of a canal throughout the section traversed by the pipe line.

In all of the section placed in the river bed, as well as all of the arroyo crossings, the field welds were subjected to very meticulous visual inspection and were 100 percent radiographed with gamma ray. The remainder of the field welds were also subjected to a rigid visual inspection, but only 15 to 20 percent were radiographed.

The pipe coating had a base of standard grade coal tar enamel reinforced with glass wrap and covered with an outer wrap of glass fiber impregnated with asphalt. The minimum thickness of the protective coating on the body of the pipe was 0.125-inch.

All of the anti-corrosive products used on these lines were manufactured in Mexico from Mexican prime materials.

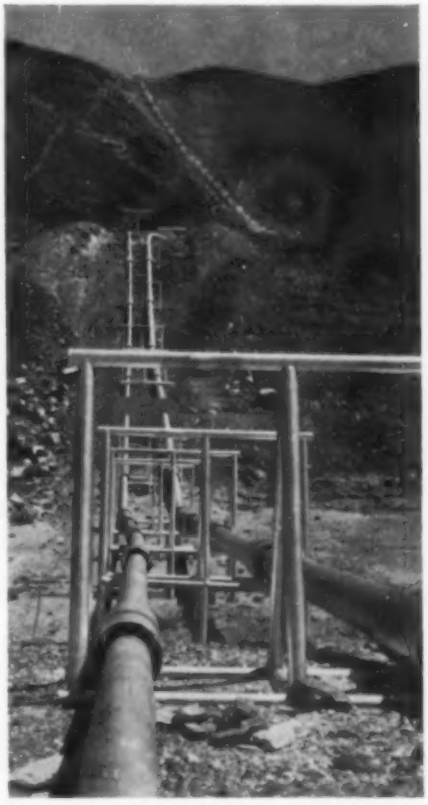
The anti-corrosive covering throughout the length of the lines was very carefully controlled by tests covering adherence, thickness, amount of the overlap of the glass fiber and outer wrap, and dielectric properties. This last was accomplished by means of 2 or 3 passes with an electronic holiday detector.

A cathodic protection system was installed on both lines, using the air-cooled, 115/230-volt, 60-cycle, single-phase selenium rectifiers, with graphite rod anode beds. In addition, for the protection of one 130 Km. section, some 2,100 meters of magnesium ribbon was installed.

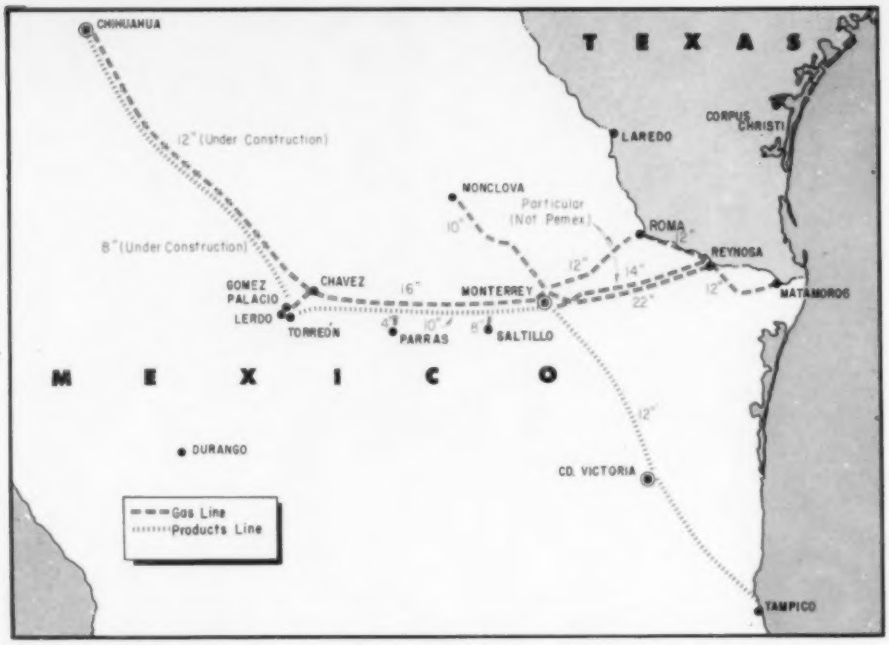
The products line was buried to a minimum depth of 0.60 meters (24 inches) in rocky terrain and a minimum depth of 0.90 meters (36 inches) in ordinary soil. At the arroyo crossings it was buried to a minimum depth of 2 meters (6.5 feet).

In those sections where the pipe ditch was rocky, the pipe was low-

Concrete anchor blocks support the lines at intervals on the sharp upward climb to the plane that extends on to the city of Gomez Palacio, Durango.



View of the upward climb constructed above grade. Where this method is used, pipeliners must allow for considerable expansion and contraction of the pipe which can come with temperature variations.



Northern Mexico pipe lines showing current construction. Parallel gas and products lines are being completed from Monterrey to Torreon and Chihuahua.

TABLE 1—Principal features of two extensions

	PRODUCTS LINE	GAS LINE
Approximate length	434 Kms. 271 Miles	428 Kms. 268 Miles
Pipe	8⅝ wt. x 0.219 wt. API Std. 5LX X-42 (With a longitudinal seam weld by the high frequency method THERMA TOOL)	12¾" x 0.250" API Std. 5LX X-42
Test pressure	1500 psi	1250 psi
Working pressure	1360 psi	1000 psi
Design capacity 1st. Stage — 2nd. Stage —	 14,000 bpd 21,000 bpd	 22 MMCFD (without compression) 38 MMCFD (with one comp. station)
Approximate total cost	78 million pesos ($ 6,240,000)	130 million pesos ($10,400,000)

Approximate cost of the receiving and distribution terminal in Chihuahua: 20 million pesos ($1,600,000)

ered onto a soft pad of selected backfill material 0.10 meters (4 inches) thick, in order to protect the coating. Following lowering-in, an additional cap of the same type of soft earth or sand was placed above the pipe to a thickness of 0.20 meters (8 inches) before backfilling with excavated material. The entire backfill was then compacted.

Final pressure testing was performed hydrostatically to a pressure of 1,350 psi.

The approximate cost of the line, including two pump stations, was $8 million.

Receiving Terminal and Distribution Facilities at Gomez Palacio. Because of its centralized location in the sales area and its good communication facilities, Gómez Palacio, Dgo. was selected as the most favorable place for the construction of the terminal and distribution facilities for the products transported by the Monterrey-Torreón pipe line.

The storage capacity of this terminal is 375,000 barrels, distributed as follows:

Gasolines	160,000 bbls.
Kerosines	125,000 bbls.
Diesel Oil	85,000 bbls.
Contaminants	5,000 bbls.
TOTAL	375,000 bbls.

In order to store this quantity of liquid products there are 11 tanks varying in size from 5,000 to 55,000 barrels. All of them are of the vertical, cylindrical type with fixed conical roofs. The tanks are protected by reinforced concrete dikes and a foam type fire extinguishing system.

For product distribution, the terminal has 28 tank truck loading stations, 20 for railroad tank cars and 28 for drums. The pumps are horizontal centrifugal type, drive by electric motors arranged for automatic starting and stopping. The liquid meters are of the positive displacement type with totalizing counters and printers.

Constant communications are maintained between the terminal and the two pump stations by short wave radio.

The approximate total cost of the terminal was $3,680,000.

Gas Line From Monterrey to Chavez, Coah., and Gomez Palacio, Dgo. The gas pipe line is 16-inch O.D. for a distance of 309 Kms. (193 miles) between Monterrey and Chávez, Coah., and 12¾-inch O.D. for 33.5 Kms. (21 miles) between Chávez and Gómez Palacio, Dgo. This reduction in diameter is due to the fact that Chávez is the point of take off for the line to be built to Chihuahua, and the 12¾-inch line is considered ample in size to carry

About the Author

F. Xavier Peredo joined Petroleos Mexicanos in 1951 as a civil engineer. Since 1955, he has been engaged in pipe line design and construction. In 1956, he was in Bartlesville, Okla., with Phillips Petroleum Co. as a Pemex representative in design of the Tampico-Monterrey products pipe line. Peredo was made construction superintendent for the Reynosa-Monterrey gas pipe line in 1957, and in 1958, was promoted to general pipe line construction superintendent for Pemex. Peredo is a graduate of the University of Guadalajara and attended the API School of Pipe Line Technology in Baytown, Texas, in the spring of 1957.

the gas volume required for the cities of Torreón, Gómez Palacio and Lerdo.

The construction of the gas line required 18,500 tons (20,500 U.S. short tons) of 16-inch 0.250 wt API Std. 5LX, grade X-52, seamless pipe, manufactured in 40-foot lengths at Veracruz mills and 2,480 tons (2,750 U.S. short tons) of 12¾-inch O.D. pipe.

The line is designed to operate at a maximum pressure of 1,000 psi, and will transport without compressor stations, up to 50 MMcfd with an initial pressure at Reynosa absorption plant of 1,000 psi. Future plans call for one compressor station to be located at Ojo Caliente, Coah., which will increase the capacity to 94 MMcfd.

The principal consumer points along the gas line are as follows:

1. The city of Saltillo is supplied through an 8-inch diameter, 22.374-Km. (14-mile lateral that runs from Ojo Caliente (Km. 64 + 856 of the main line) to Saltillo. The present consumption in Saltillo is around 3.5 MMcfd, but the lateral can handle up to 8MMcf to take care of future growth.

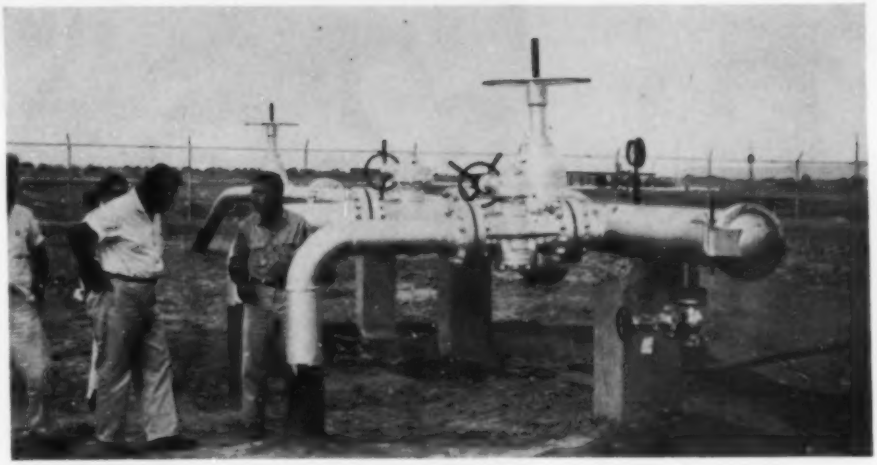
2. The city of Parras, Coah., is supplied through a 4-inch, 23.705-Km. (14.8-mile) lateral that has been finished between Paila, Coah., (Km. 200 + 666 of the mainline) to the city of Parras. The immediate consumption in Parras is expected to be some 3 MMcf, but the lateral can handle up to 8MM.

3. The tri-city group consisting of Gómez Palacio, Torreón and Lerdo are all very close together, and will be supplied by a distribution system that will take off from the terminal at Gómez Palacio, Dgo.

The main line is divided into 13 sections by means of 12 full-opening gate valves.

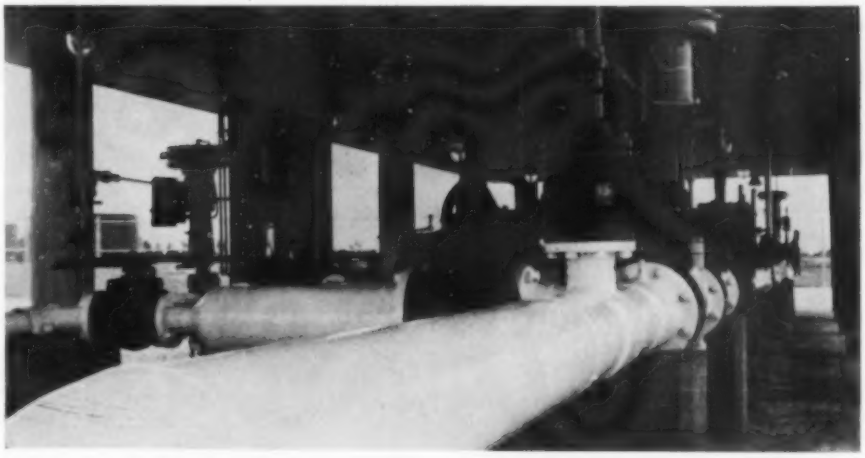
The rigid construction specifications previously outlined for the products line were also strictly applied to the construction of the gas line. Final pressure testing was performed hydrostatically to a pressure of 1,250 psi.

Contractors for the construction of both pipe lines were Fabricas Protexa, S. A. of Monterrey, N. L. and Constructora Inde-Conducciones, S. A. of México, D. F.



Products line pig trap at the terminal of Gomez Palacio, Dgo. The products line was sectionalized by 13 valves and two pig traps.

Exterior view of regulation station at Gomez Palacio. All told three cities are supplied from this point.



Interior view of regulation station. The pipe, valves, fittings and most of the controls were manufactured in Mexico.

The approximate total cost of the gas line was $9,280,000.

Extension of the Lines to Chihuahua. Early in January of this year, construction was commenced on the section from Gómez Palacio to Chihuahua for the products line, and from Chávez to Chihuahua for the gas line. These lines should be finished in 18 months, but great effort will be made to better this program.

Table 1 describes the principal features of the two lines.

The construction work has been turned over to the same contractors who laid the lines from Monterrey to Torreon—Constructora Inde-Conducciones and Fabricas Protexa.

—The End

Coal-water slurry burns inside a boiler. As the 70-30 coal-water spray leaves the spray nozzle in the center the coal is mixed with heated primary air swirling through the furnace at 300 feet per second. The hot air vaporizes the water and ignites the particles of coal in less than 1/100th of a second. This photo was taken at Jersey Power & Light Company's E. H. Werner generating station at South Amboy, N. J.

'Liquefied' Coal Piped Directly Into Boiler

New coal-water slurry can be pipelined, pumped, stored and burned like low-grade fuel oil

By Donald M. Taylor, Engineering Editor, PIPE LINE INDUSTRY

A NEW COAL-WATER slurry that behaves like low-grade fuel oil in many respects may give coal a renewed vigor as a competitor in the fuel market. Coal men point out that the slurry can be pipelined, stored in tankage without agitation and fired directly into a furnace without dewatering.

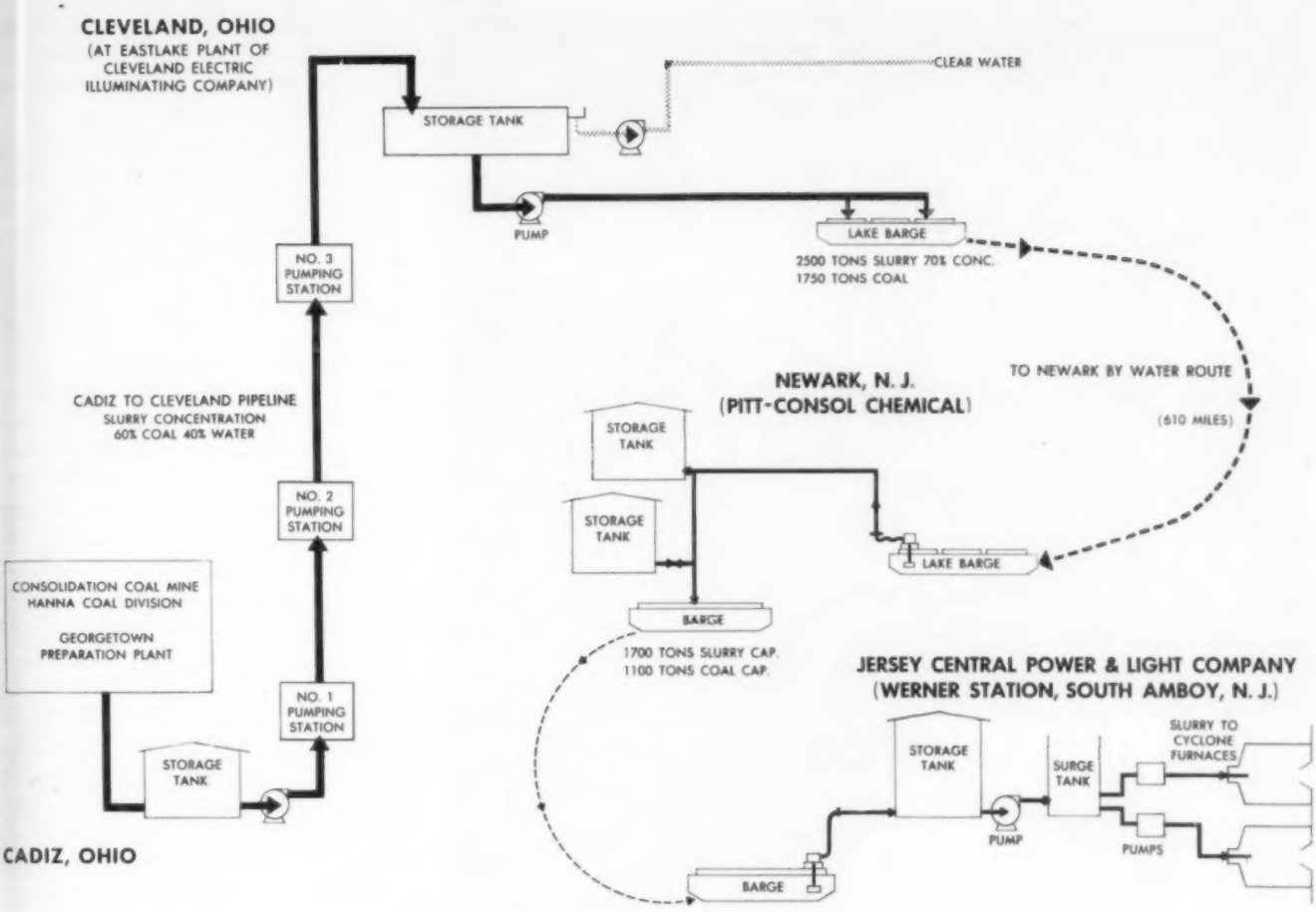
Texas Eastern Transmission Corp. and Consolidation Coal Co., joint developers of the new "liquefied" coal, say it will cut the delivered cost of coal by as much as $1 per ton in certain areas. This is enough to keenly interest power utility companies.

Recently, representatives from some 75 power companies attended a demonstration of the new fuel in action at Jersey Power & Light Co.'s South Amboy, N. J. generating station. There, an existing 59,000-kw boiler was undergoing a four-week test run, using some 3.5 million gallons of the fuel, apparently with notable success.

Details of Test. For this test, Consolidation Coal's Cadiz, Ohio, plant had pulverized 10,000 tons of coal, blended it into a special 60-40 coal-water slurry, and then pipelined it through the company's 108-mile-long coal pipe line that runs to Cleveland. Here the mixture was allowed to settle out in storage long enough to decant sufficent water to reduce the water content to 30 percent. Then the resulting 70-30 coal-water slurry was loaded into conventional 2,500-

Where did you first hear of this new development?

Last February, PIPE LINE INDUSTRY published a rather complete story on this development under "Ideas for the Future" on Page 51. Check your February issue and you'll find that the original story on this subject was highly accurate—Editor.

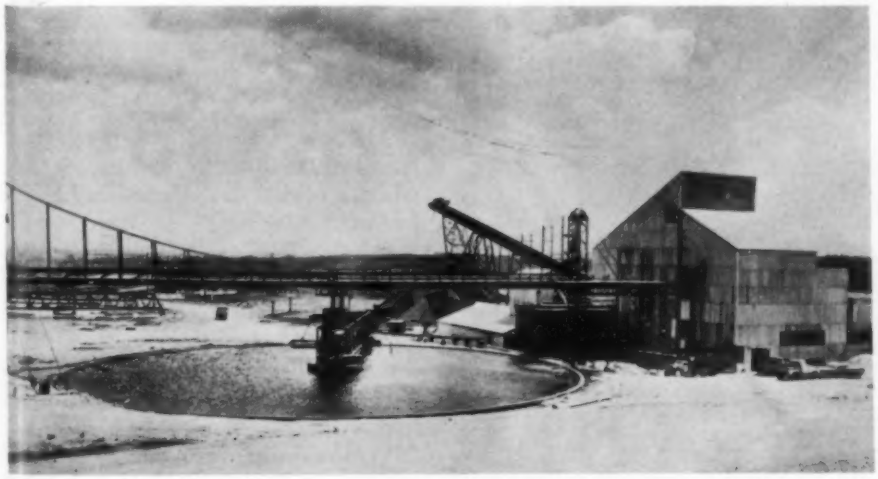


Schematic diagram of the coal-slurry's trip from Cadiz to South Amboy. The slurry is odorless and part of the barges were able to transport molasses on their return trip.

ton barges for a trip through Lake Erie and the Hudson River to Newark, N. J.

At Newark the slurry was temporarily stored in conventional fuel oil storage tanks and then loaded into shallow-draft barges for transshipment to South Amboy, where it was pumped into a million-gallon storage tank erected to handle the new fuel during the test run.

From the time the slurry has been converted from 60-40 to 70 percent coal and 30 percent water, it had maintained a high degree of consistency during handling, shipment and storage. Settlement of solids proved to be a minor problem, and no agitation or circulation was required during storage.



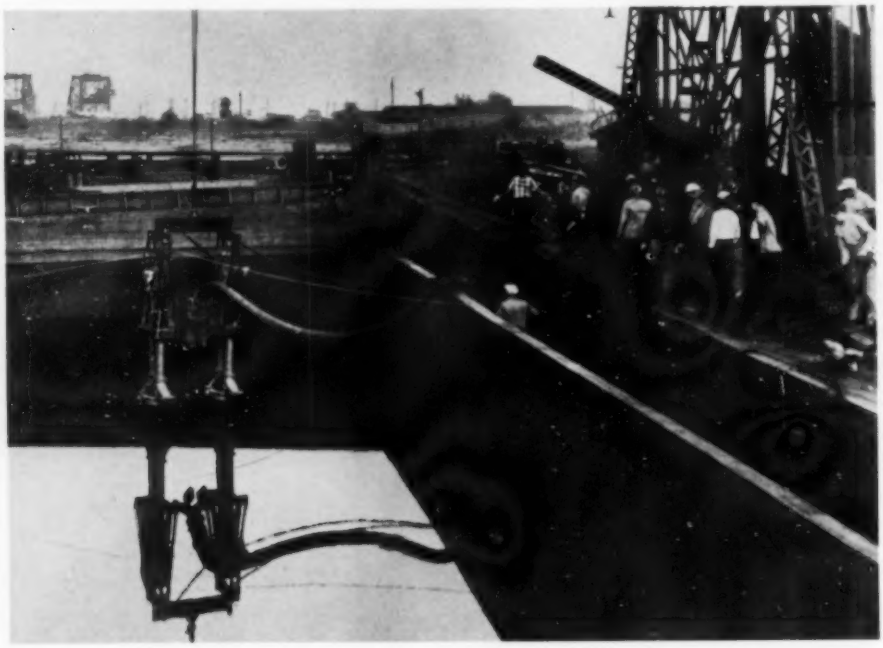
Slurry preparation plant at Cadiz, Ohio. In the past this plant has prepared a 50-50 coal-water slurry for the 108-mile, 10-inch line that runs from Cadiz to Cleveland. In this instance, the slurry was 60-40 and the 60 percent coal consisted of a variety of sizes of coal particles.

At 1:18 a.m. on October 18, the new slurry fuel was switched into the existing test boiler which had been constructed in 1953. The boiler's two-cyclone type burners (shown schematically in an accompanying drawing), had had only minor modification. Slurry had been piped to each burner, and special nozzles which produce a hollow conical spray had been installed.

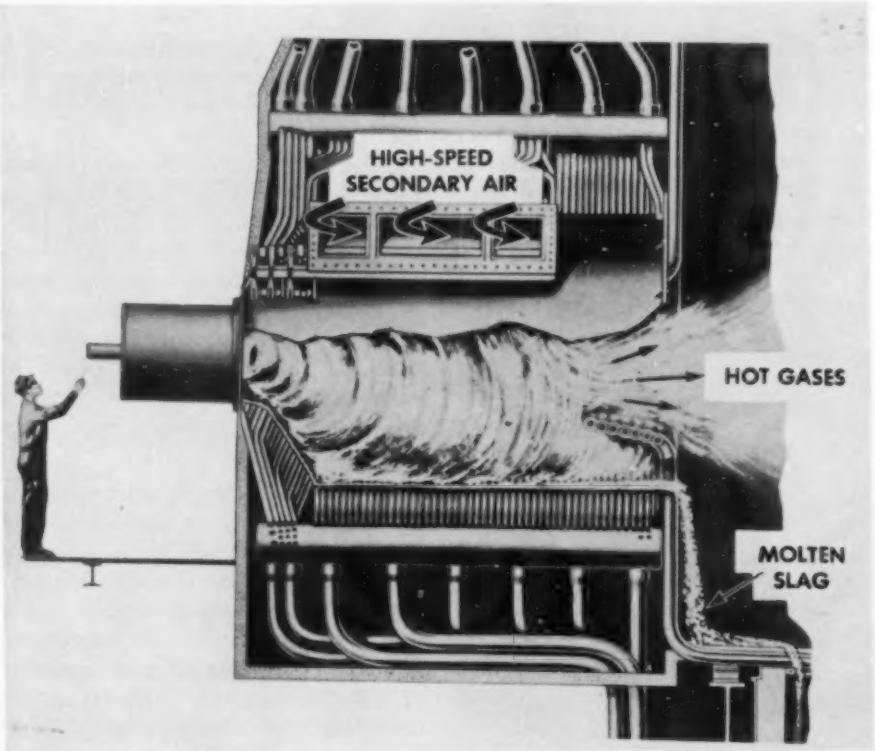
How Burners Work. Hot primary air at 700° F engages the slurry spray as the air spins at high velocity around the coal nozzle. This hot primary air vaporizes the water from the coal particles, as it accelerates them into a tangential path. Ignition of the finer particles occurs almost instantaneously, producing a 3000° F flame temperature.

Just past the ignition zone, hot secondary air—five times the volume of the primary air and spinning in the same direction—is introduced into

the cyclone at a velocity of 300 feet per second. The resulting centrifugal force throws coal particles to the outer wall of the cyclone furnace, and the temperature of the normally solid coal ash is so high that it is turned into a liquid and drains from the wall into the primary furnace. Unburned coal particles are trapped in the molten ash on the furnace walls where they ignite and burn in the high velocity secondary air. Water in the slurry goes up the stack as a vapor. Surprisingly, there is less of this vapor than in a natural gas-fired boiler.



Unloading slurry at South Amboy. The new fuel was easily handled by conventional pumps.



How the cyclone burner works. Fuel enters in conical spray from left. It engages primary air which dries it and ignites it. The temperature is so hot inside the furnace that the ash is flung against the sides in a molten state by the high-speed secondary air. Unconsumed particles of coal adhere to the molten ash until they, too, burn. Flame temperature is about 3,000 F.

Inside the 12-foot length of the cyclone furnace, the particles of coal are dried, ignited and burned in only 1/100th of a second.

Efficiency of combustion is not quite as high as that of other fuels. The water vapor causes a drop of about 3 percent from the efficiency of dry coal, and at best, a gallon of the mixture has the Btu content of only about ⅔rds a gallon of fuel oil.

Advantages. Aside from the reduction in cost, company spokesmen point out that the slurry offers additional advantages over solid coal. For one thing, the fire-hazard is virtually nil during shipment, storage and handling. The slurry can be burned only if the water is evaporated in some manner. In addition, the mixture is odorless and produces no inflammable vapors.

But even more important from the standpoint of a utility company which normally uses dry coal as a fuel, the coal slurry does away with the sizeable chunk of investment that coal-burning power plants must tie up in coal handling equipment. In a conventional coal burning power plant, about 5 to 7 percent of the total cost of the plant is allocated to coal storage and handling facilities. This would amount to about $3.5 million in a conventional 500,000-kilowatt generating station.

What Is the Secret? Primarily it lies in the slurry preparation. By using a blend of graded particles of different sizes, Consolidation Coal and Texas Eastern found that a stable slurry could be prepared which would not readily settle out. Presumably, the object of the slurry blending is to reduce the interstitial space so that a minimum of water will fit into the mixture.

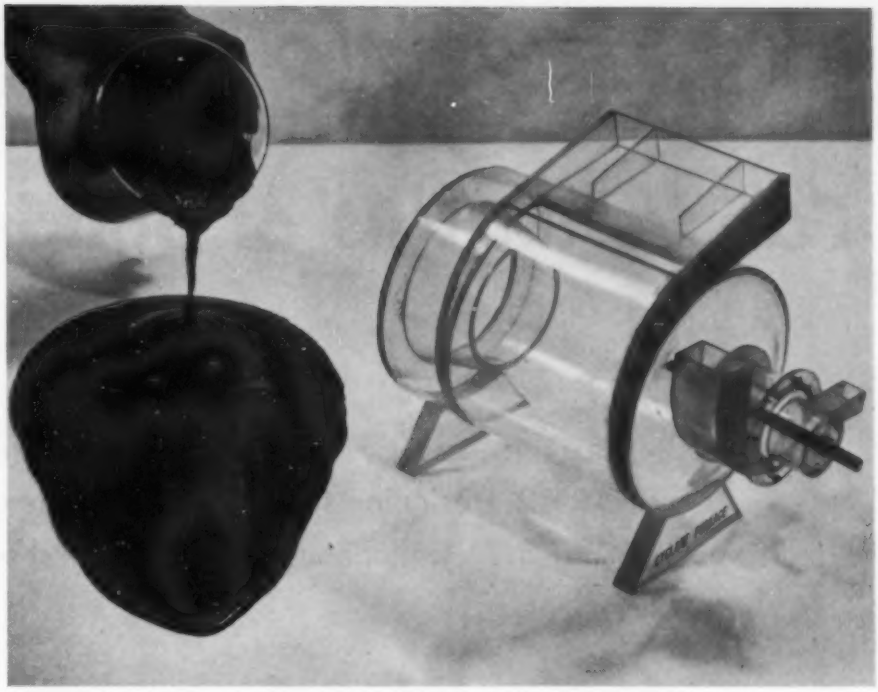
The cyclone type burner, which handles the slurry directly, is one which Babcock & Wilcox has had on the market since 1953. However, the slurry can be burned in other burners by centrifuging it and then running it through a pulverizer.

Background of coal pipelining. Consolidation Coal completed a $2 million pilot coal pipe line system in 1951 at Georgetown, Ohio. The line was used to pump coal slurry around loops and up and down hills for test purposes. After initial tests it appeared that the number one problem

to be solved was that of internal corrosion-erosion.

After research and engineering departments had devised a solution to this problem, Consolidation contracted with The Cleveland Electric Illuminating Co. for delivery of 18 million tons of pipe line coal over a 15-year period. After constructing a 108-mile, 10-inch line from Cadiz to Cleveland, Consolidation commenced deliveries in February 1957. The biggest disadvantage of the system was that the 50-50 coal-water slurry had to be dewatered to about eight percent before the coal could be consumed. This was accomplished by conventional filtration and thermal drying.

This line has proved highly successful; since 1958 it has operated almost continuously. It was in operation 97½ percent of the time last year.



Cutaway model of the burner and a sample of the new fuel. In many respects, the coal-water slurry behaves like low-grade fuel oil. One gallon of the slurry is equivalent to two-thirds of a gallon of fuel oil.

Future Pipe Lines. Texas Eastern's move into coal pipelining came as a result of an extensive engineering study of the future energy sources and trends. According to their engineers' findings, the life of known oil and gas reserves can be expressed in decades; whereas the life expectancy of coal reserves is usually expressed in centuries. In addition, coal reserves are widely and rather evenly dispersed throughout the United States. (Most laymen are surprised to learn that 66.6 percent of the coal in place lies west of the Mississippi River.)

Summed up, Texas Eastern feels that there are plentiful supplies of coal strategically located with respect to stable markets such as power generating plants, and that slurry pipe lines can provide the most economical means of coal transportation. Historically, the price of coal at the mines has been stable, the wide variance in price has always come from the transportation costs. Texas Eastern spokesmen point out that in many instances, the transportation cost exceeds the original cost of the coal at the mine by the time it reaches its market.

Texas Eastern and Consolidation Coal are making no bones about their intention to lay coal pipe lines where the supply and the market will justify them. They have already entered into one arrangement to construct a 350-mile coal pipe line from the coal fields of West Virginia and Pennsylvania to the East Coast. The line will be between 20 and 30 inches in diameter; it will operate at 1,000 psi and have stations about every 50 miles.

Internal corrosion in the line will be controlled by the addition of certain inhibitors.

Big-Inch Line Coal Slurry Tests. To determine whether or not a line of such dimensions is practical, Texas Eastern and Consolidation actually experimented with a 40-mile length of large diameter line. They proved conclusively that size of line afforded no difficulties for the new slurry.

Expected Growth. The inroads which coal will make into the fuel market will be moderate in the near future. Gas and fuel oils presently have a number of advantages over the new fuel.

But a few years away pipe lines may well be carrying most of our energy materials—gas, petroleum liquids and solids. —**The End**

WERNER PLANT SLURRY BURNING DEMONSTRATION
OPERATIONS BULLETIN
NOVEMBER 6, 1961

First Slurry Firing Started 1:18 A.M., 10/18/61

As of 8 A.M., This Date

Total Hours operated	336
Total Power Generated, MWH	16,162
Average Load, MW	48.1
Total Gallons of Slurry Burned	1,750,035
Tons of Coal Burned	5,995.7

Nozzle Size, #41 Burner 11/16 Inch, ID
#42 Burner 55/64 Inch, ID

Slurry Concentration 68% Coal, By Weight

Proximate Coal Analysis, Dry

Volatile	Ash	Sulfur	BTU	A.S.T.
40.0	7.45	2.6	13,530	2185° F

Typical Screen Analysis

8	14	28	48	100	200	325	—325
0.2	5.0	20.0	18.0	13.5	6	6.2	30

Barge Unloading Time

7-8 Hours
For 340,000 Gallons

Fundamentals of Solids Pipelining

PART 1: Past, present and future of solids pipelining

PART 2: Designing solids pipe line systems

PART 3: Miscellaneous engineering and economic factors

By R. F. McNamara,
Ford, Bacon & Davis, Inc.,
New York City

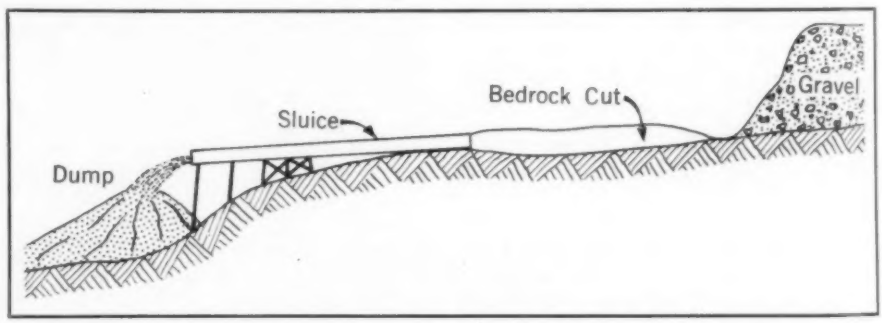
MENTION A SOLIDS-CARRYING pipe line to the average pipeliner and he is apt to treat the subject as something new enough to be lumped with space missiles, and electronics. Yet, actually, solids-carrying pipe lines were invented over 100 years ago!

Background. The first records of hydraulic systems handling solids go back to 1850. The first patent for solids transportation goes back to 1891. And the first solids pipe line, in the accepted sense of the word dates back to 1914!

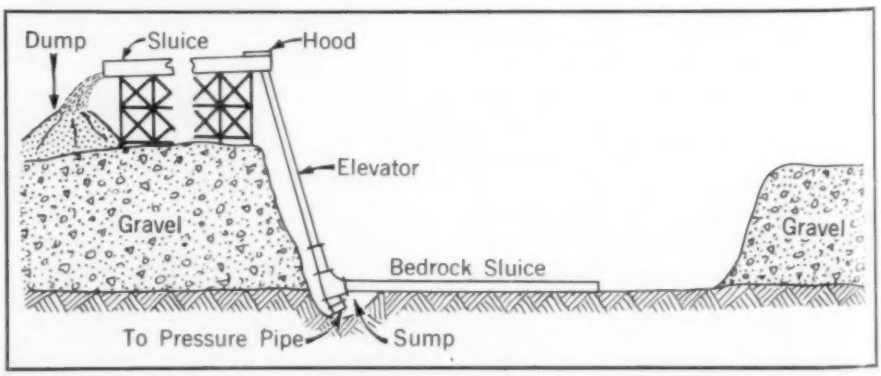
Compared with my field of engineering, the use of pipe lines to carry solids cannot be called "new." The earliest pumping system for solid-water slurries were used in California during the great gold rush. In most locations there was sufficient elevation change to gravity feed the gold-bearing gravel directly to sluices which separated the gold from the sand and gravel. In those few cases, however, where the elevation change was not adequate, hydraulic elevators were used to raise the water and gravel to a higher level. In these elevators, the slurry was pumped as much as 55 feet, to the desired elevation where it was discharged into a flume or sluice.

The earliest U.S. patent claim for pumping solids through pipes was made by Wallace C. Andrews of New York. His application was dated March 26, 1889. It described a method of transportation *"involving the following operations: first, providing an enclosed stream of running liquid; second, reducing the material to be transported if too large or of too great specific gravity by comminution to a condition in which it will be carried by the momentum of the liquid; third, introducing into the running stream the material to be transported; and finally, separating the same from the liquid at the place of destination."*

This description would fit almost any solids line built today. He was



Earliest U.S. solids pipe lines were used in the California gold rush. Gravel and water were piped and even pumped for short distances.

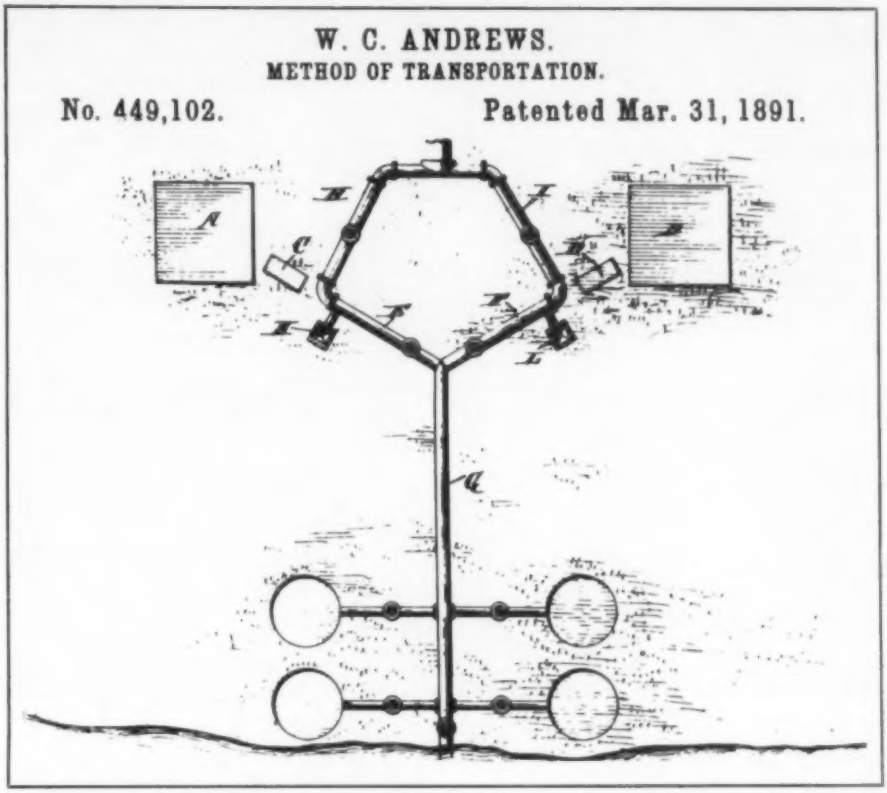


Dumping gravel and water against an elevation change in the gold rush days. These slurries were pumped as high as 55 feet for discharge into a flume or sluice.

granted Patent No. 449,102 on March 31, 1891, and it is reported that a model of his invention was displayed at the Columbian World's Fair Exposition in Chicago in 1893. But no commercial use was ever made of this invention.

The first solids pipe line, in the sense that we use the word today, was built in England in 1914 by Gilbert G. Bell, a British power plant engineer. It was an 8-inch cast iron, bell and spigot pipe line, 1750 feet long, running from coal docks on the Thames River to a boiler plant. The coal-water slurry was pumped using a sludge-type centrifugal pump with a 7-inch impeller driven by a 50-hp motor. The line delivered about 50 tons per hour of coal in a half-coal-half-water mixture. The velocity was about 4 feet per second. Water was recycled after it was separated from the coal.

Solids Pipelines Are Common. Pipe lines are large-volume carriers; by their very nature, they lose their economic attractiveness when volumes are small. All fuels are used in large quantities and pipe lines are used in carrying all major fuels. This includes coal as well as gas or oil. It is significant that many of the major advances in the field of solids pipelining have been made on coal lines. Pipelining of coal has always been a part of coal mining. Pipe lines have been used in handling mining refuse from coal mines. The material has been mixed with water and pumped to waste banks or to worked-out portions of the mine. Coal washery refuse has been pumped to silt banks. One of the largest of these lines was built in 1938 by the St. Claire Coal Company and consisted of a 14-inch line, one mile long, which handled 190 tons per hour of 20 percent slurry.



Patent on solids pipelining was granted in 1891 to W. C. Andrews. It covered all of the pertinent points including reduction of size of the material to be pumped, introducing it into the flowing stream and separating it at the end of the line. His patent covered the transportation of fine coal, cotton, cotton seed, sugar cane, etc. Key to the drawings shown here: A and B are the piles of coal to be transported. C and D are rotary coal-crushers; K and L are hoppers that feed the coal into the pressurized line, H, I, E and F.

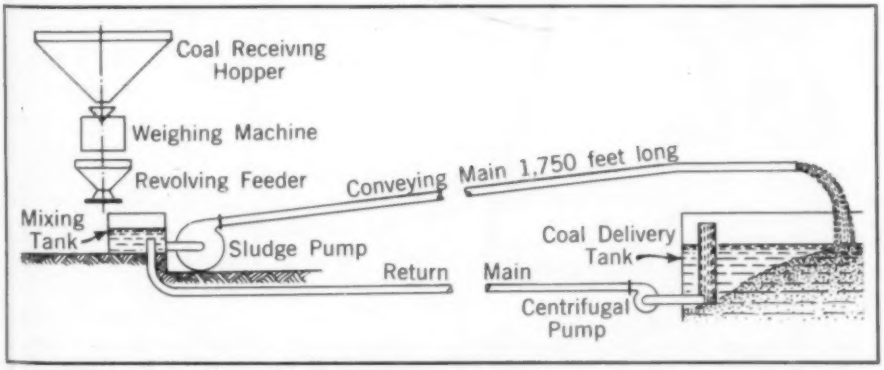
Several coal lines have been built for the express purpose of transporting coal to market. The French built and are still operating a 6-mile, 15-inch coal pipe line. Consolidation Coal Co. moves coal 110 miles by pipe line into the Cleveland area. The Russians, who lay claim to "the first long-distance coal pipe line" transport 220 tons per hour of minus $\frac{1}{32}$-inch coal through a 12-inch line for a distance of 38 miles.

Even in the actual utilization of coal, pipe lines have played a part. Hydraulic sluicing of ashes and clinkers is common and the waste product has been carried as far as 2 miles from the power plant.

Mining operations usually involve the handling of large volume of materials, and in this field too pipe lines have been widely used. They have been used in the mining and processing of tin, copper and nickel. These lines handle ores, ore concentrates and plant tailings.

There are 20 phosphate rock pipe lines in the United States which handle more than 30 million long tons of rock per year. These lines are 14 to 16 inches in diameter and range up to 5 miles long. Solids lines have also been built to move limestone, borax and gilsonite. The gilsonite line, which handles about 50 tons per hour of this material, is 72 miles long and ranks as the second longest solids line in the United States.

There are other materials which move in large enough quantities to justify pipe line consideration. These include sulfur, wood pulp, rock salt, sand and gravel, lignite, food grains (such as wheat and rice) and many more. Pipe lines are now being considered as carriers for all these materials. During the last few years, for



Coal pipe line built in 1914 in England by Gilbert Bell, power plant engineer. The line was 8-in. bell and spigot, cast iron, 1750 feet long, running from the coal docks on the Thames River to a boiler plant. The coal-water slurry was pumped using a sludge type centrifugal pump with a 7-in impeller driven by a 50 hp motor. It delivered 50 tons per hour of coal!

example, Ford, Bacon & Davis, Inc. has made studies of transporting some six separate materials for distances up to 600 miles.

Limitations on Materials. From this discussion, it appears that pipe lines can be used to transport almost any solid material. Neglecting the problem of economics, this statement is almost true. There are only three conditions which must be met before a material can be handled in a pipe line. These three are:

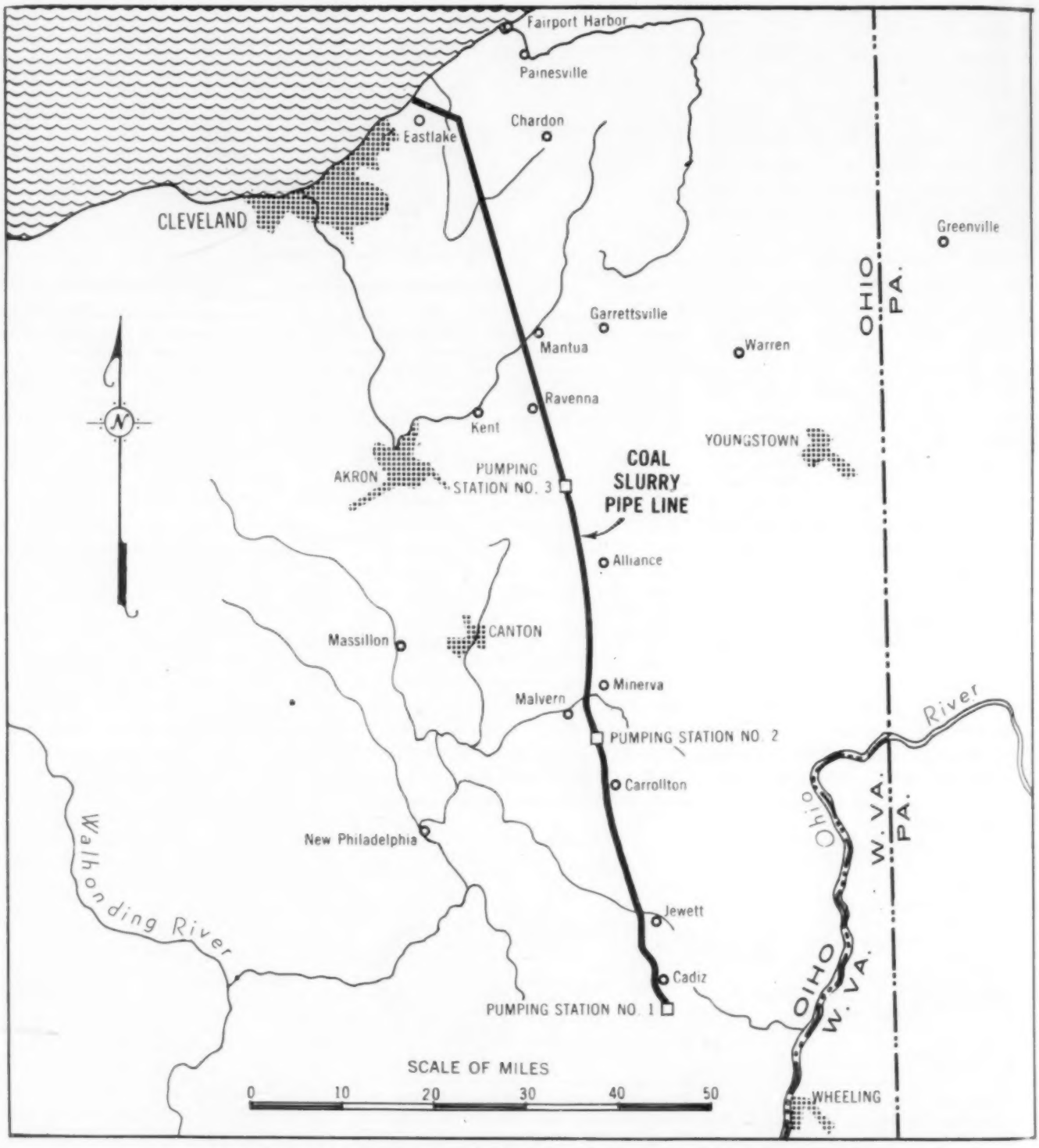
1. The solids must not undergo any undesirable change as a result of the mixing or separation of the solids and liquids, or the actual transportation itself.

2. The slurry should not exhibit wide variations in viscosity.

3. The particle size must not be too large.

If a material meets all three of these conditions, and most materials do, there is no technical reason why it cannot be transported in a pipe line.

The problems caused by an undesirable change in the bulk material as a result of any step in the pipelining operation are obvious. If an irreversible chemical or physical reaction between the solid and fluid carrier occurs, a slurry handling cannot be used. The taste and character of food



Map of the 110-mile coal slurry pipe line designed by Ford, Bacon and Davis for Consolidation Coal Co.

Photo courtesy of The Pacific Coast Pipe Co., Ltd.

Wood stave pipe handles slurries. This line, at the Hollander Mines, Ontario, Canada, handles a minus 200 mesh tailings slurry. Wood pipe in this service has good erosion resistance and a low coefficient of heat transfer which is important when handling water in cold climates.

grains are adversely affected by many of the elements of a pipe line system and these problems have yet to be completely solved. Particle degradation occurs in most solids systems and with some materials, lignite is an example, this degradation is so severe that pipe line systems cannot be used.

Not all chemical or physical change is bad. In some cases it is very desirable. Sugar cane stalks for example have been cut and transported in a water solution. During this transportation, the time of transit provides an opportunity for the partial solution of the sugars. Studies have also been made of a method of transporting wood chips in water with suitable chemicals so that partial pulping will occur during transit.

Many slurries behave as non-Newtonian fluids. These fluids do not have a constant viscosity. This variation depends on the characteristics of the slurry. The viscosity may either increase or decrease, depending upon the pumping rate and the material type. Quicksand is one of the most familiar non-Newtonian fluids. The more it is agitated, the lower its viscosity becomes.

Non-Newtonian fluids can be classified into four major groups, depending upon the way in which the viscosity varies. To a pipeliner, the type of variation is not as important as its extent. When the variation of viscosity of suspenison is not too great, then it may be handled in pipe lines. Many common substances such as milk or petroleum drilling muds, are non-Newtonian in character but, because the variation in viscosity is slight, they can be handled without serious problems. The engineer responsible for the design of any solids pipe line system should be aware of the problems which can exist. As a rule, some fairly simple tests of the slurry in a rotational viscometer, can give an adequate idea of the viscosity changes which will occur.

The maximum sized particle which can be transported in a pipe line is not simple to determine. It depends in large measure upon the properties of the particle and the fluid stream. There are four conditions which determine the maximum particle size. These are:

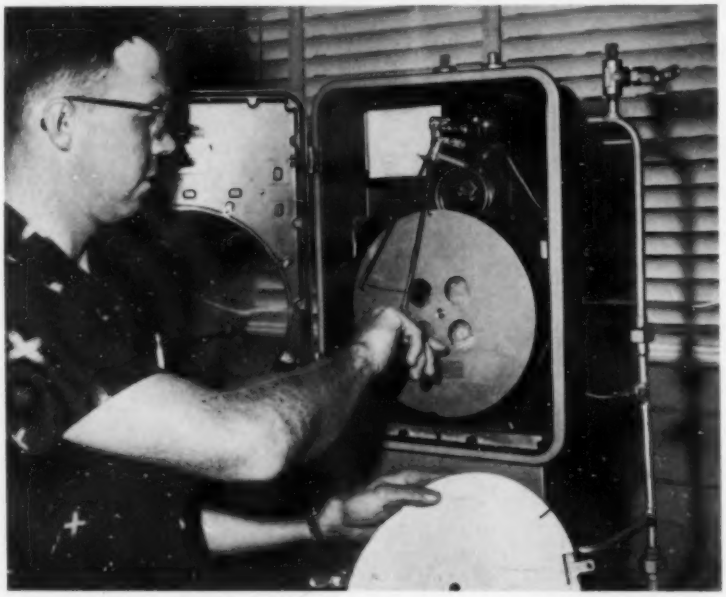
1. The percentage of large particles in the slurry.
2. The shape of the particle.
3. The fluid velocities used.
4. The difference between the specific gravity of the particle and specific gravity of the liquid.

If the particle is a relatively small percentage of the total, if the particles are spherical in shape, if high fluid velocities are used, and if the difference in gravities of the particle and the fluid is small, then large particles can be transported in a pipe line. These four conditions are seldom met in practical pipe lines. In most cases the particles are limited to ¼ to ⅜ inch in size. But the closer these four conditions are approached, the larger the allowable particle size may be.

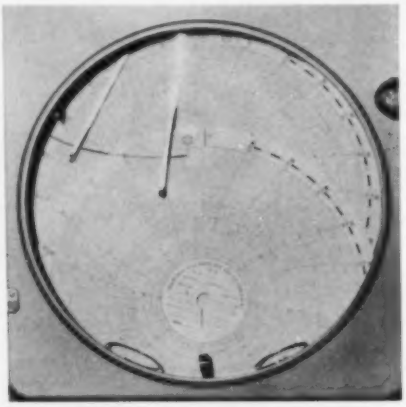
Part 2 next month will discuss the design of solids pipe line systems.

About the Author

R. F. McNamara is a chemical engineer with Ford, Bacon & Davis, Inc., of New York. He received his B.S. degree from Polytechnic Institute of Brooklyn in 1950 and a M.S. degree from Institute of Technology in 1952. Since then he has worked for Arabian American Oil Company for three years, and he has been with Ford, Bacon & Davis for six years. Most of this work has been in the pipe line field, with emphasis on two-phase mixtures.

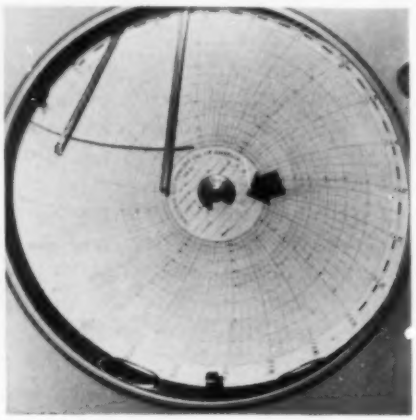


1. Once a week the meter is loaded with 32 charts by an employe. This cuts down the frequent visits necessary in the past; and insures greater accuracy by changing charts at the same time every day.



3. Old chart falls into storage receptacle; chart underneath continues recording, eliminating carry-over from one chart to next.

2. Near the end of 24-hr cycle, a small tab at center of plate (arrow) pierces the chart. As the chart revolves, tab peels chart off the plate.



4. At specific times, charts are removed from the chart catcher, checked for accuracy and mailed to NGPL's gas accounting department in Chicago offices.

Automatic Chart Changer Is Paying Off for Natural Gas Pipe Line

A CHART CHANGER which automatically changes orifice meter charts at a specific time each day (or week) is paying off for Natural Gas Pipe Line Company of America. The company has installed 65 of the devices on sales meters and 12 on purchase meters. The company has ordered 44 additional units which will be in service by next year.

NGPL engineers reasoned that this was a necessary step in the trend toward modernization and automation.

The chart changer fits onto the face of each meter plate. At a preselected hour, usually 12 noon (the beginning of the gas accounting day), it separates the completed chart recording from the meter and deposits it in a metal container below the meter. The meter pens then drop onto a fresh chart to automatically begin the flow measurement for the new day. Recorded charts are kept in the metal container until they are picked up, checked for accuracy and mailed to the Gas Accounting Department in the company's Chicago offices.

In addition to reductions in time and travel to measurement stations, the chart changer insures delivery of a fresh chart at the exact instant of completion of the 24-hour recording cycle. This provides a substantial savings in accounting cost because it produces a standardized accounting period. This eliminates the necessity of carrying over balances—either plus or minus—from one chart to the next, as was common when charts were changed at odd hours by hand.

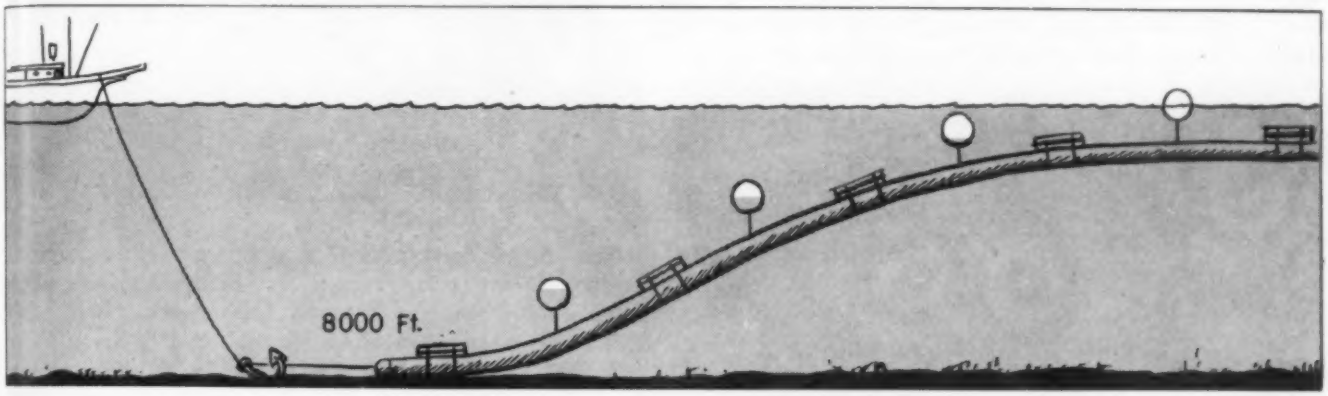
A total of 32 charts can be loaded onto the recorder to provide—if necessary—a month's run.

ACKNOWLEDGMENT

Photographs courtesy *Between the Lines*, Natural Gas Pipe Line Company, Chicago.

Ideas for the Future

By **Donald M. Taylor,** Engineering Editor



French Lay Pipe in 8,000 feet of Water in Mediterranean

French pipeliners are turning out to be as salty as any you'll find. First, they showed us a thing or two about desert pipelining by laying gas and crude lines from discoveries in the Sahara to points on the Mediterranean. Next, they entered offshore pipelining with a splash!

They proved you could successfully lay pipe in 2,500 feet of water—(see the August 1961 issue of PLI, page 16) and recently, key men in the French pipe line industry advised PLI editors that they had been successful in laying test sections of pipe in 8,000 feet of water. What's more, they are confident they can lay a pipe line 125 miles across the Mediterranean between Mostaganem in Algeria and Cartagena, Spain—despite the 8,900-foot-deep water!

The latest test was concerned with connecting long sections of pipe at sea and with laying pipe in water below 8,000 feet.

For purposes of the test, the French had converted a World War II LCT by adding a pipe screwing machine on the port side, adding a new beefed-up winch and two additional propellers which could be directed 360 degrees. The latter enabled the pipeliners to better handle the ship in wind and current.

This ship has apparently solved the problem of connecting up sections of line at sea, because the sea-going French pipeliners were able to make connections 15 miles from shore successfully.

Next, came the deep water laying tests. As described in the August issue of PLI, the French had developed an entirely new concept in offshore pipelining. To briefly review the highlights of the method: French scientists first developed a new X-95 steel pipe which could withstand the high external pressure without excessive wall thickness. In addition, they developed a new screw-type connection for linking long sections of pipe. It was based on the lens type high-pressure fitting and in all tests, it has given no evidence of leaking.

The key to the pipe laying technique is in the method used to attain buoyancy. For primary buoyancy, the French attach containers of gasoline (which have considerable buoyancy and won't crush in deep water) and bundles of polystyrene floats. These reduce the negative buoyancy of the line to a little over one pound per lineal foot.

Then, about every 500 feet, they attach the so-called "breathing buoys." These make the entire operation possible. Outwardly, these buoys appear to be ordinary spherical steel buoys—and that's what they are with two exceptions: First, they have small holes in the bottom, and rubber and nylon bladders pressured with air. As one of the buoys, descends in the water, water enters the bottom of the buoy with increasing pressure, compressing the bladder. The smaller the bladder gets, the less the buoyancy the buoy has.

How does this operation work? After the pipe line—submerged a few feet beneath the waves—has been towed to its position in the line, one end of the section of pipe is hauled to the bottom by an anchor—(or perhaps by one end of the previously laid section of pipe). As the line decends to bottom, the breathing buoys progressively and successively lose buoyancy allowing the pipe to glide to bottom without buckling.

In the latest tests, the French used the method with a few alterations to lay line in water 1½ miles deep. In one instance, the winch failed to recover the pipe, and it had to be dragged to shore through 25 miles of water. French engineers were amazed to find, that despite this rough treatment, "the pipe contained not one liter of water!"

PIPE LINE INDUSTRY will soon have a more comprehensive article on this subject, meanwhile, let's take our hats off to some very daring and highly imaginative French pipeliners!

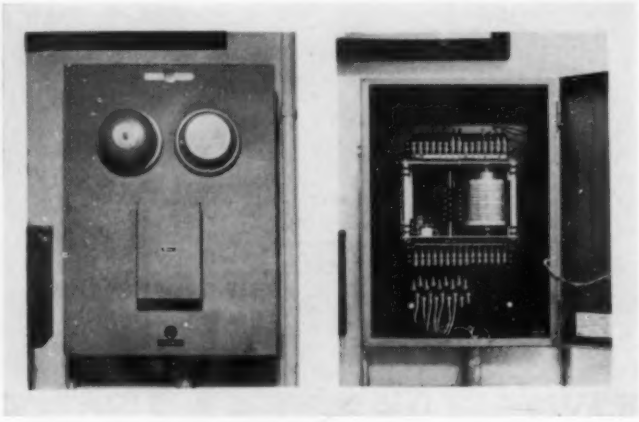
Stronger ceramic generator developed

A ceramic generator about four times the strength of intermetallic thermoelectric generators has been developed by Minneapolis Honeywell for the U.S. Army. The output of the generator is about 1000 microvolts per degree C; and the pilot model delivered to the Army's

Picatinny Arsenal is designed to produce 100 volts under no load.

The generator is made of 14 layers—opposite sides of each layer are coated with nickel oxide and platinum.

This new discovery could greatly improve thermoelectric generators now finding uses in cathodic protection and in providing current for pipe line communications.



New device answers the phone and reports trouble at unattended station

A new signaling device which can be called from any phone anywhere, will report trouble for an unattended remote station.

Once the station has been called, the device will sound a single-stroke bell if everything is going all right. But if there is trouble, it will sound a coded buzzer to describe its nature.

The initial installation of this new device was at Connecticut Light & Power Co.'s generating plant near Monroe, Conn. It is proving highly successful; and if my guess is right, this device should find its way into the instrumentation of remote pipe line pump stations.

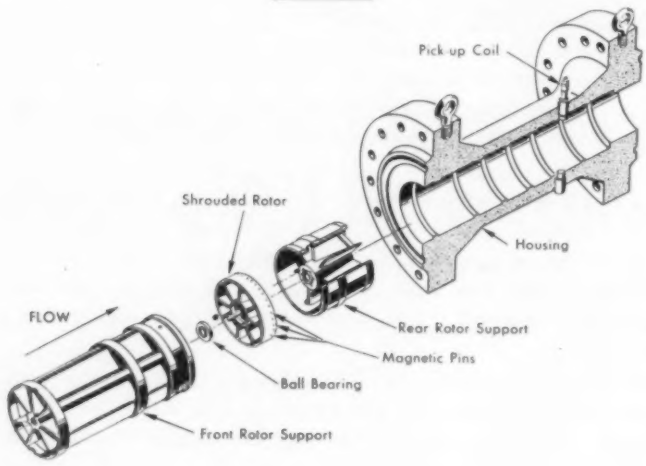
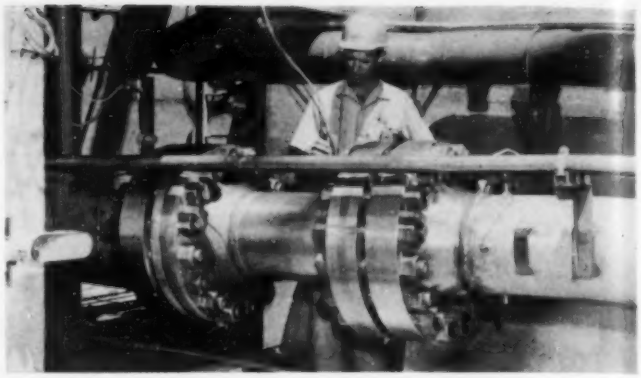


FIG. 5

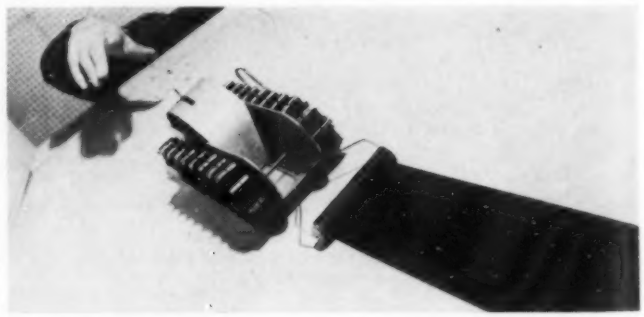
14-Inch turbine flow meter measures at 1 million bpd rate

Large turbine-type flow meters are being used to measure the LOX and rocket fuel consumed in the F-1 rocket engine which now develops about 1.5 million pounds of thrust, during brief tests. The flow may be at the rate of 30,000 gpm (or as much as 1 million barrels per day) although the test may last only 1¼ seconds. But during this short interval, the meter must accelerate with the flow and come to a halt in the split second when the flow ceases.



The 14-inch meters are of stainless steel throughout. The flowing fluid turns a shrouded blade rotor, and the shroud contains stainless steel magnetic pins which cut through a magnetic field generated by a permanent magnet to produce electrical pulses. Both frequency of the pulses and the voltage reflects the volume of flow.

The meters operate at 2500 psig, and the temperature of the LOX is —300 F. These Fischer & Porter meters were beefed up to withstand the shock loads and great pressure drop.



Robot will clean and paint tanks

Esso Research and Engineering has designed a robot, resembling a small army tank, to clean and paint relatively smooth metal surfaces. A preliminary model of the device has been built and has successfully demonstrated the feasibility of the idea.

Magnetic rubber tractor treads keep the robot stuck to surfaces, and an air-operated turbine connected to the treads drives the device. Direction is decided by an operator using pneumatic controls.

Paint is fed to the pressurized roller through a hose under pressure. The painting starts only after the surfaces have been cleaned by mechanical chipping tools, etc. The latter can be carried out simultaneously with the painting in one continuous operations.

Esso engineers estimate that four such automatic "tools" about three feet long and 1½ feet wide could paint a medium sized tanker in 16 man days. Manually, the job requires 200 man days.

How to do it

PIPE LINE HINTS

$10 is paid for each illustrated acceptable contribution. Mail to The Editor, PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1, Texas

Check List Should Improve Maintenance Gang Efficiency

Radio has greatly improved the efficiency of pipeliners—but it has made them careless too. Time was when a gang that went out on the job had to take all the necessary tools and equipment to do the job. But often, you'll hear the call come in on the radio, "Bring us some starting fuel and six new spark plugs, etc."—calling for items that should be on the job in the first place.

In this respect, pipe line maintenance gangs can take a tip from airline pilots. Before every flight, the pilot and co-pilot must meticulously go over a check list. This is perhaps the most important thing the pilot does, too!

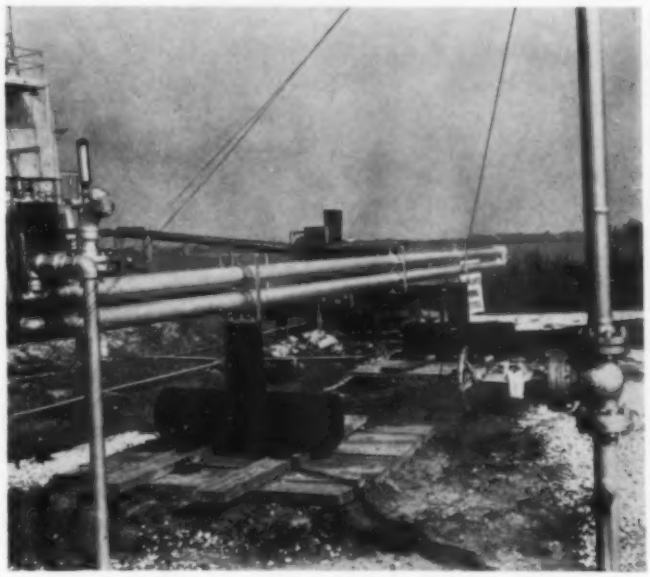
Check lists for maintenance crews can pay off, too. This is particularly true in time of foul weather—when pipe line breaks and other trouble is most likely to strike. Here is a partial check list, which can go a long way toward getting everything on the job that's needed. You can add to it to fit your own crew's need:

CHECK LIST

- ☐ 1. Boots, hats, rain suits and gloves for each crew member.
- ☐ 2. A box of rags.
- ☐ 3. Two extra starting ropes for trash pumps.
- ☐ 4. Cold weather starting fuel (ether).
- ☐ 5. An extra can of gasoline.
- ☐ 6. Dry kindling for starting a fire or a salamander. (Crews are going to start fires—make it easier and quicker.)
- ☐ 7. A plentiful supply of skids—including short 1x4 or 2x4's which can be used to protect a tree from the bight of a winch line.
- ☐ 8. Extra spark plugs and accessories for each engine.
- ☐ 9. Power generator and flood lights with stands.
- ☐ 10. Extra snatch blocks and chains and come-alongs. Equipment will get stuck, better prepare for it.
- ☐ 11. Tarps and other sheltering equipment.
- ☐ 12. Extra burning and welding equipment—lens, lens covers, burning tips, etc.
- ☐ 13. Hand tools and equipment units required for making repairs.
- ☐ 14. Other items deemed necessary by foreman.

Scrap Pipe Makes Good Flexible Exchanger Support

When high-pressure gas is expanded down to a pressure compatible with the mixing valve on a gas engine,



the temperature change set up is sufficient to cause hydrates to form. One solution is to heat the gas by circulating water-jacket water from the engine around the fuel line in a heat exchanger.

As shown here, the exchanger can be supported by two four-foot lengths of scrap ten-inch pipe, to which have been welded channel iron risers to carry the clamps enclosing the return joints of the heat exchanger. These two pipe bases are free to roll or slide as temperature changes make accommodations necessary. Heavy planking forms the base which allows the angle iron sections to be positioned for carrying the exchanger.

Bright Stripes Can Make Compressor Building Safer

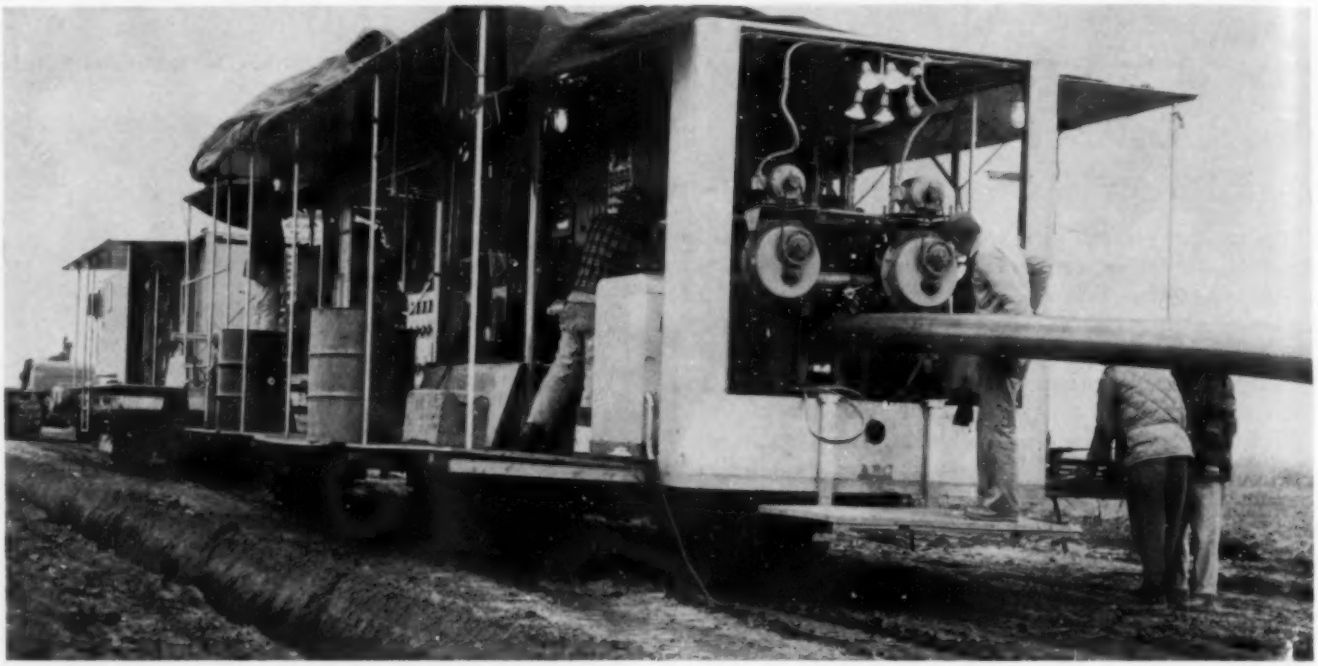
Paint bright stripes—or strip on phosphorescent strips—on the top and bottom treads in the compressor basement stairs and personnel using them will be less likely to stumble. (Incidentally, a stripe seems to be more effective than a solid-colored tread in bright paint.)

Add a cross of phosphorescent adhesive to each compressor building door, and you will make it easier to find in time of emergency—when there is some possibility that the lights could go out.

Many companies use bright paint to outline "safeways" throughout the compressor buildings. This practice has certainly paid off in manufacturing plants, and presumably, it is paying off in compressor buildings, too.

WHAT'S HAPPENING IN PIPE LINE CONSTRUCTION

By Donald G. DePugh, Construction Editor



MOBILE PIPE MILL ON ROW. A mobile pipe mill which makes pipe from coils of steel plate is automatically producing 1,200-foot sections of 8⅝-inch pipe as it moves down the Cherokee Pipe Line Co. right of way between Wichita Falls, Texas, and Temple, Okla. Its speed ranges up to 50 feet per minute. Girth welds are required only every 1,200 feet. The 32-ton mill bends the plate into a circle, makes the radio high-frequency longitudinal resistance weld. The 30-mile test is the machine's first commercial application. The new pipe mill was developed by Mobile Pipe Corp. of San Francisco. Williams Brothers Company is contractor on this section of the 127-mile products line being laid from Wichita Falls to Oklahoma.

Tennessee Gas Files Application On $56 Million Expansion Program

Tennessee Gas Transmission Company has filed an application with the Federal Power Commission proposing a $56 million expansion program.

The expansion project includes 210 miles of large diameter pipe lines and 87,700 additional horsepower. Tennessee would lay 76 miles of 36-inch looping the line from Greenup, Ky., through Ohio to Mercer, Pa., plus 76 miles of 30-inch loops from Mercer to Coudersport, Pa., and from Hamburg, N.Y., to Clifton Springs, N.Y.

Also, 58 miles of 20-inch gathering line would be laid from the company's gathering system in Louisiana and into the Gulf of Mexico to the Ship Shoal area.

The new facilities would increase delivery capacity to over 2.9 billion cubic feet per day. It would provide additional gas to meet needs of its susidiary, Midwestern Gas Transmission, and other customers.

In a companion application, Midwestern sought approval to purchase an additional 15 MMcf of gas daily from TGT at a connection of their system in Tennessee for delivery to Northern Illinois Gas Company in the Chicago area.

Tennessee's application is an amendment to an earlier application pending since May, 1960.

Esso Sirte Plans 50-Mile Crude Line

Esso Sirte, Inc., plans to construct a 50-mile, 20-inch crude pipe line from the Raguba field to Zelten field in Libya. The line will connect with Esso Standard Libya's system from Zelten to Marsa El Brega which was completed this year.

Esso Sirte and Esso Standard are subsidiaries of Standard Oil Company (N.J.).

The new line, expected to be in operation in 1963, will deliver 40,000 barrels of crude daily. A gas-oil separation plant will be constructed at Raguba.

Southwest Gas Pipeline Co. Formed by Charles Coates

Charles S. Coates has been named president and chairman of the newly formed Southwest Gas Pipeline Co. with headquarters in Houston. The company will own and operate facilities recently acquired through a corporate merger with Southwest Gas Gathering Company.

Coates had served the Tennessee Gas Transmission Company as senior operating vice president and later became president and chairman of the board of Trans-Canada Pipe Lines Limited. John L. Weiler is the vice president of the company. He had been with Southwest Gas Gathering Co.

Williams Brothers Laying Colombian Products Line

Williams Brothers Company has begun preliminary construction work on a 50-mile, 8-inch products line in Colombia for Empresa Colombiana de Petroleos. The line will replace

part of an existing 6-inch line from Puerto Salgar to Bogota.

The line will have an elevation variation from 600 feet at the initial pump station and tank farm at Puerto Salgar to 8,400 feet at the Bogota pipe line terminal. Expansion program also calls for relocation and modernization of pumping stations on present system and increasing operating pressures to a maximum of 1,750 psi.

When the entire 80-mile line is replaced with 8-inch pipe further horsepower is added, capacity will be increased from 20,000 to 35,000 barrels per day.

Cherokee Pipe Line Lets Contracts on Products Line

Cherokee Pipe Line Company has awarded contracts to Mitchell Construction Co., and Williams Brothers Co. for construction of 127 miles of 8-inch products line in Oklahoma and Texas.

Cherokee's 127-mile, 8-inch system will extend from Oklahoma City to Wichita Falls, Texas. Completion of the $2.6 million line is expected in January. Initial daily capacity of the line will be 20,000 barrels.

The line will connect at Oklahoma City with Cherokee's existing system originating at Ponca City, Okla. Cherokee's line extends from Ponca City to Wood River, Ill., via Tulsa. Laterals extend to Wichita, Kansas, and Oklahoma City.

When completed the new system will bring products from Conoco, Cities Service and other refineries to Wichita Falls and Dallas-Fort Worth area. Cherokee is owned by Continental Oil Company and Cities Service Pipe Line Company.

Arkansas Louisiana Gets Approval to Buy MidSouth

The Federal Power Commission has granted Arkansas Louisiana Gas Company to acquire the natural gas facilities of MidSouth Gas Company. MidSouth distributes natural gas in eastern Arkansas and operates interstate lines extending into Tennessee. Its system includes about 225 miles of transmission lines and 706 miles of distribution lines.

Arkansas Louisiana will issue 336,000 shares of common stock to MidSouth for distribution in liquidation to that company's stockholders.

Natural Gas Pipeline Co. Plans $27 Million Project

Natural Gas Pipeline Company plans to lay 242 miles of large diameter pipe line in a $27 million expansion program in 1962.

The new facilities would increase NGPL's daily capacity by 95 MMcf. The expansion also includes about 16 miles of lateral lines, a new compressor station, two booster stations and other facilities.

United Gas Authorized 40 Miles of Loop Lines

The Federal Power Commission has authorized United Gas Pipe Line Corporation to lay 40 miles of 24-inch loops on its Mobile, Ala., to Pensacola, Fla., system.

United plans to build 21 miles of the line this year and the remaining portion in 1962.

Commonwealth Oil Co. and Jupiter Oils to Merge

Commonwealth Oil Co., a producing company which operates an offshore gas gathering system off Louisiana coast, will be merged into Jupiter Oils Limited.

Jupiter will take steps this month to become a Delaware corporation and then Commonwealth will be merged into The Jupiter Corporation. Commonwealth shareholders will be issued new preferred stock of Jupiter.

Jet Lines Products System Completed

Jet Line, Inc. has completed construction of an 80-mile, 12-inch products line from New Haven, Conn., to Westover Air Force Base near Springfield, Mass.

The $6 million project was financed and constructed by Savin Brothers, Inc. The system has pump stations at New Haven and Hartford, Conn.

Japanese Gas Line Starts Across Country

A cross-country gas pipe line is under construction from Kubiki to Tokyo, Japan. The 210-mile, 12-20-inch line is scheduled for completion in 1962. Capacity of the line will be 17.5 MMcf of gas daily.

It will consist of 190 miles of 12-inch from Kubiki to Soka, which is about 20 miles from Tokyo. The remainder of the line will be 20-inch.

PROPOSED PIPE LINE CONSTRUCTION

Here in convenient summary form is Pipe Line Industry's listing of company, line size, length, service, location and project status.

*** indicates that this item is a new entry or that status of this project has changed since last appearance.**

U.S.

American Petrofina, 133 miles, 6-inch, products, Mount Pleasant, Texas to Grapevine, Texas, $2.5 million, planned.

Algonquin Gas Transmission Co., Boston, 25 miles, 20-inch; 8 miles, 8-inch, gas, and 12,000 hp addition in Massachusetts, $6 million, FPC Authorization.

Ashland Oil & Refining Co., Ashland, Ky., 24 miles, 6-inch, crude, Blaine to Catlettsburg, Ky., planned.

Border Gas Transmission Company, 300 to 400 miles, gas, gathering, in South Texas, $10 million, planned.

California Gas Transmission Company, Los Angeles, (subsidiary of Tennessee Gas Transmission Company), 292 miles, 20-34-inch gas, from Mexico-California border near Mexicali, to Los Angeles and 10,000 hp. to tie into Texas Mexico-California line, $50 million, before FPC and California Public Utilities Commission.

* **Cherokee Pipe Line Co.,** 127 miles, 8-inch, products, Oklahoma City to Wichita Falls, Texas, $2.6 million, contract let to **Mitchell Construction Co.,** and **Williams Brothers Co.**

Coastal Transmission Corp., Houston, 71 miles, 3 to 10-inch, gas, laterals; 5,500 hp in stations at Port Lavaca, Texas and Eunice, La. and 1,500 hp at Robstown, Texas, $7 million, FPC authorization.

Colorado Gas Transmission Co., 250 miles, 20-inch, gas, Southwest Colo., to Colorado Springs, before Colorado PUC.

Colorado Interstate Gas Co., Colorado Springs, 140 miles, 34-inch, gas, Green River, Wyo.,-to-Provo, Utah; 109 miles,

26-inch, Texas Panhandle to southeastern Colorado, 136 miles, 34-inch, southeastern Colorado-to-Pueblo, Colo.; 107 miles, 30-inch, Pueblo-to-Denver, $91 million, FPC conditional authorization.

Colorado Oil & Gas Corp., Denver, 400-miles, gas, from Gubik field to Fairbanks, Alaska, planned.

Columbia Gulf Transmission Company, Houston, 97 miles, 30-inch, loops in Kentucky, Tennessee, Mississippi and Louisiana; 29 miles, 12-inch lateral in Louisiana, $15 million, before FPC.

Department of Interior, Washington D.C., 400 miles, 4-10-inch, helium Bushton, Kans. area to Amarillo, Texas contract let to **Williams Brothers** Co. for engineering.

El Paso Gas Supply Company, El Paso, Texas, 228 miles, 30-inch, gas, main, Live Oak to Sutton County, Texas, $30 million, before FPC.

El Paso Natural Gas Company, El Paso, 199 miles, 30-inch, Permian-San Juan crossover loop, before FPC.

34 miles, 20-inch, Puckett to Goldsmith, before FPC.

23 miles, 20-inch, Goldsmith to Eunice-Plains line, before FPC.

9 miles, 20-inch, Goldsmith-Plains loop, before FPC.

43,600 hp in new and existing stations in Texas, Oklahoma, New Mexico and Utah, before FPC.

400 miles, 34-inch, Salt Lake City, Utah, to California border, FPC conditional authorization.

35 miles, 8-inch, gas, to deliver gas to Southern Union Gas Company in Dallas, $1 million, before FPC.

Equitable Gas Company, Pittsburgh, Pa., 31 miles, 16-inch, and 26 miles, 20-inch, in West Virginia and Pennsylvania, $5 million, before FPC.

Great Northern Pipe Line Co., 64 miles, crude, extension to Lignite field, North Dakota, planned.

Houston Texas Gas & Oil Corp., St. Petersburg, Fla., 235 miles, 2-6-inch, gas laterals, 30,000 hp in five new stations; $16 million, FPC authorizations.

Humble Pipe Line Company, Houston, 270 miles, 6,8,10-inch, products, Baytown to San Antonio and Austin, Texas, contracts let on 20 miles, 8-inch to **T-T Construction Co.**

Kansas-Nebraska Natural Gas Company, Hastings, Neb., 165 miles, 2-8-inch, gas, extension from Alliance, Neb., to Chadron, Crawford, Hemingford, Hay Springs, Gordon and Rushville, Neb., before FPC.

45 miles, 2-3-inch, gas, in Kansas, approved by Kansas Corporation Commission.

2,000 hp addition at Scott City, Kan., FPC approval authorization.

2,500 hp addition at Holcomb, Kan., before FPC.

Lone Star Gas Company, Dallas, 47 miles, gathering lines in Palo Pinto, Erath and Stephens counties, Texas, planned.

Lone Star Gathering Company, Dallas, 63 miles, gas, gathering, in DeWitt and Victoria counties, Texas, $2½ million, planned.

Long Island Pipeline Company, New York, 75 miles, 20-inch, products, Linden, N. J., to Long Island, N. Y., $30 million, planned.

Lo-Vaca Gathering Co., (Coastal States Gas Producing Co.) 230 miles, 6-20-inch, gas, gathering, Live Oak to Lavaca County, Texas, planned.

Matador Pipe Line Corp., Denver 175 miles, crude, from Bottineau, Burke and Renville counties, N. D., to Cromer, Man., Canada, $4 million, proposed.

Michigan Wisconsin Pipe Line Company, Detroit, 88 miles, gas, 3,000 hp, take gas from Northern Natural at Janesville, Wis., before FPC.

Mid-American Pipe Line Co., 405 miles, 10-inch, LPG, Superior, Wis., to Chicago, $12 million, considered.

100 miles, LPG, extension from Ogden City, to Charles City, Iowa, planned for 1962.

Monterey Gas Transmission Company, Houston, 216 miles, 30-inch, gas, Clear Lake, Texas, to Alexandria, La., planned.

* **Natural Gas Pipeline Co.**, Chicago, 224 miles, large diameter, gas, $27 million, planned.

Northern Gas Products Co., (subsidiary of Northern Natural Gas Co.), 350 miles, 8-inch, LPG, Bushton, Kan., to Des Moines, Iowa, $12 million, planned.

Northern Natural Gas Company, Omaha, 50 miles, gas line, 2,000 hp, before FPC. 99 miles, gas, 4,660 hp, $8.9 million, before FPC.

365 miles, gas, branch lines, and 14 miles, 26-inch $11 million, before FPC.

Northwestern Refining Co., crude gathering system, Rival and Lignite fields, North Dakota, $625,000, Public Service Commission approval.

Ohio Fuel Gas Co., 59 miles, gas, 4-24-inch main lines, in Belmont, Carroll, Cuyahoga, Fairfield, Logan, Lorain, Marion, Muskingum, Stark and Wayne counties, Ohio, $5.1 million, planned.

Oklahoma Illinois Gas Pipeline Co., (Fish Engineering, Shell Oil Company, Pan American Petroleum Corp.) 550 miles, gas, Woodward, Okla., to St. Louis, planned.

Pacific Gas & Electric Co., San Francisco, 120 miles, 30-inch gas loops, Topock to Milpitas, before FPC.

44 miles, 3-20-inch, gas, gathering, in Sutter and Colusa Counties, Calif., $2.3 million, planned.

Pacific Lighting Gas Supply Co., Los Angeles, 24 miles, 16-inch, gas, Gaviota to Goleta, Calif. $1.7 million, before Public Utilities Commission.

Panhandle Eastern Pipe Line Co., Kansas City, 305 miles, 30-inch, 40 miles, 26-inch, gas, loops, and 43,000 hp, and gathering facilities, $60 million, before FPC.

200 miles, 22-24-inch, gas, lateral, from Elk City, Okla., to Haven, Kan., $15. million, before FPC.

Olympic Pipe Line Co., 324 miles, 6-16-inch, products, Ferndale, Wash. to Portland, Oregon, $17.5 million, planned.

Pennsylvania Railroad, products pipe lines along railroad's right of way to serve Friendship Airport in Baltimore and Washington's National Airport, Andrews Air Force Base, and Dulles International Airport, considered.

Phillips Pipe Line Co., Bartlesville, Okla., 75 miles, main line, 85 miles, gathering crude, from Camrick field, Gray, Okla., to Phillips, Texas, planned.

Southern California and Southern Counties Gas Cos., Los Angeles, 93 miles, 34-inch, California-Nevada border to Newberry, Calif.

Southern Pacific Pipe Lines, Inc., Los Angeles, 100 miles, liquid Portland to Albany and Eugene, Ore., considered.

St. Lawrence Gas Company, Inc., Ogdensburg, N. Y., 75 miles, gas, main, United States-Canadian border to Ogdensburg, N. Y., $3.4 million, FPC approval.

Suwanee Pipe Line Co., (Sinclair Oil Corp.) Atlanta, 800 miles, 22-inch, products, Baton Rouge to Greensboro, N. C., planned.

Tennessee California Gas Transmission Company, (subsidiary of Tennessee Gas Transmission Co.), 100 miles, 26-inch, gas, gas fields in South Texas to Texas-Mexico border near Reynosa, before FPC.

* **Tennessee Gas Pipeline Co.**, Houston, 210 miles, 30 and 36-inch, gas, loops, from Greenup, Ky. to Coundersport, Pa., and from Hamburg to Clifton Springs, N. Y.; 58 miles, 20-inch gathering lines, offshore Louisiana; 87,700 additional horsepower, $56 million, before FPC.

50 miles, 26-inch loop in Kentucky, FPC authorization.

21 miles, 16-inch, 2 miles, 12-inch, gas, offshore Louisiana, Vermilion blocks 46 and 64, $2.3 million, before FPC.

84 miles, 10-20-inch, gas, offshore Louisiana, FPC authorization.

Texas Eastern Transmission Corp., Shreveport, La.

66 miles, 30-inch, gas, loops, between Vidor, Texas, and Lambertville, N. J., and 33,710 hp in four existing stations, $17.5 million, temporary FPC authorization.

144 miles, gas, 46,300 hp. $27.8 million, for 1962, before FPC.

Texas Eastman Company, Longview, Texas, 280 miles, 6-inch, products, Houston to Longview, contract let on 207 miles to **O. R. Burden Construction Corp.**

Texas Power & Light Company, 230 miles, 6-16-inch, gas, Anderson County, east Texas to Fannin County and McKinney-Denton area, planned.

Transcontinental Gas Pipe Line Corporation, Houston. 188 miles, 36-inch, gas loops, in Louisiana, Mississippi, Alabama, Georgia, North and South Carolina, Virginia, Maryland and Pennsylvania; 46,800 hp in 13 stations; 28 miles, 20-24-inch gathering laterals in Louisiana; $49 million, before FPC.

13 miles, 24-inch and 18 miles, 20-inch loops, Louisiana, FPC authorization. 14 miles, 16-inch laterals, 1-mile, 12-inch lateral, Louisiana, $2.1 million, FPC authorization.

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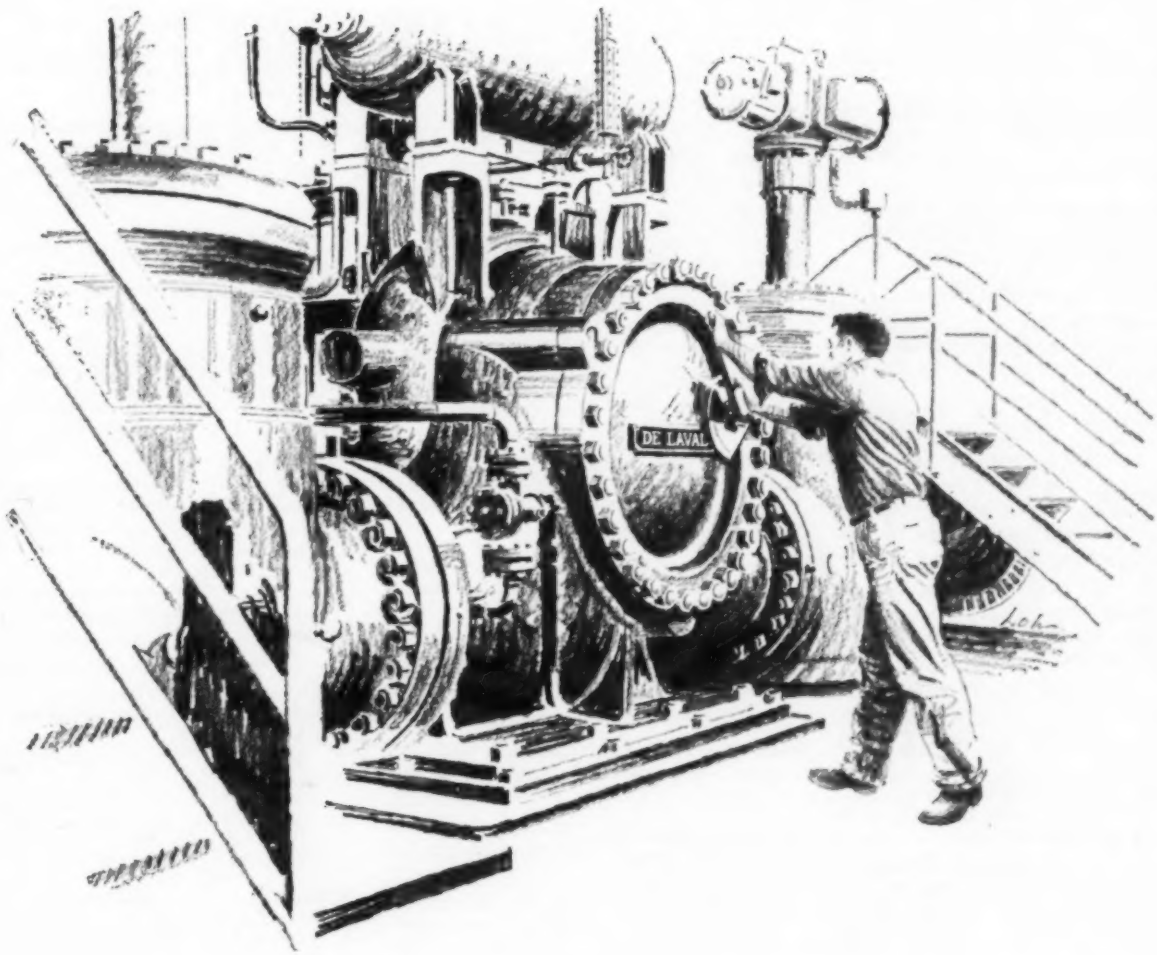
De Laval Steam Turbine Co., Trenton 2, New Jersey.



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29 miles, 20-inch, gas, and 2,500 hp, in South Texas to take gas from South Texas Natural Gas Gathering Co., $2.4 million, FPC authorization.

Trans-Southern Pipeline Corp., Houston, 1,080 miles, 12-inch, LPG, from Mont Belvieu, Texas, to Danville, Va., and 215-mile spur line from Atlanta to Georgia-Florida border, $63 million, planned.

* **United Gas Pipe Line Corp.**, Shreveport, La., 40 miles, 20-inch, gas, loops on Mobile-Pensacola line, $3.8 million, FPC authorization.

10 miles, 30-inch, loops, Terrebonne and Assumption Parishes, La., $1.9 million, before FPC.

Utah Gas Pipeline Corp., 200 miles, gas, San Arroya and Bryson Canyon fields to Salt Lake City, $15 million, planned.

Valley Gas Transmission, Inc., Houston, 55 miles, 3 to 8-inch, gas, gathering, in Hidalgo, Brooks, Starr and Jim Wells counties, Texas, $15 million, before FPC.

International

ACT Oils, Ltd., Montreal, 400 miles, crude, Dawson Creek, B. C., to Bella Coola, B. C., before B. C. Government.

Ajax Alberta Pipeline Ltd., 28 miles, 10-inch, gas, main, Morinville to Westlock, Alta., planned.

Assistencia de Oleodutos du Petrobras, Rio de Janeiro, 280 miles, 12-inch, crude, Rio de Janeiro to Belo Horizonte, Brazil, planned.

Alberta Gas Products System, Ltd., 725 miles, 8-12 inch, gas liquid gathering system, to connect with Trans Mountain system for delivery to U.S. border, before Alberta Conservation Board.

Bituminous Oil Pipeline Co., Calgary, 250 miles, crude, from Athabasca tar sand plant in northeastern Alberta to Edmonton, approved.

Britamoil Pipe Line Co. Ltd., 64 miles, 8-inch, gas-liquids, Rimbey to Edmonton, Alberta, $2 million, authorized.

British American Oil Co., Ltd., Toronto, 125 miles, gas, Pincher Creek fields to Calgary, Alta., before Alberta Public Utilities Board.

Burmah Oil Co., Ltd., 850 miles, crude, 20 inch, from Nahorkatiya to Calcutta, India. Contract let on 250 miles to Mannesmann-Saipem.

Cartier Gas Corp. (St. Maurice Gas, Inc., and Consumers Gas Co., Toronto), 170 miles, gas, Montreal to Quebec City, planned.

Consolidated Gathering Systems, Ltd., Calgary, 198 miles, crude, Sturgeon field to Edmonton, planned.

* **Empresa Colocbiana de Petroleos**, 50 miles, 8-inch, products, Puerto Salgar to Bogota, contract let to Williams Brothers Co.

Empresa Nacional Calvo Sotelo, Madrid, Spain, 150 miles, 14-inch, crude, main line, Malaga to Puertollano, Spain, $10 million, planned.

* **Esso Sirte, Inc.**, (Subsidiary Standard Oil Co. (N. J.) 50 miles, 20-inch, crude, Raguba field to Zelten, planned.

Gas del Estado, Buenos Aires, 1,050 miles, 30-inch, gas, Comodoro Rivadavia field to Buenos Aires, $380 million, bids submitted for design and construction by ENI,

Gas Trunk Line of British Columbia, Vancouver, 250 miles, 30-inch, gas, main, Fort Nelson to Taylor, B. C., planned.

Gasversorgung Sueddeutschland, 180 miles, gas, Mannheim to Karlsruhe to Kehl and Ulm, $20 million, planned.

Hudson's Bay Oil & Gas Co. Ltd., Calgary, 41 miles, 4-8-inch, condensate, Waterton-Castle River area and Pincher Creek field to Carway to connect with Glacier system, authorized.

Hughenden Pipeline, 125 miles, products, Dick Lake gasoline plant to Hughenden Region, Alta., planned.

Independent Pipe Line Co., 2,019 miles, 34-36-inch, crude, Edmonton to Montreal, 23,000 pump horsepower, $395 million, before Borden Commission.

International Gas Co., Los Angeles, 1,800-miles, 30-inch, gas, Reynosa to Mexicali at California border, considered.

Interprovincial Pipe Line Company, 350-mile extension from Toronto to Montreal, looping line from Edmondton to Toronto, crude, $240 million, considered, products pipe line, Superior, Wis., to Chicago, considered.

90-mile, crude, Hamilton, Ont., to Buffalo, N. Y., before National Energy Board of Canada.

Kuwait Oil Co., 30 miles, 22, 24, 26-inch, crude, Minagish field to Ahmadi, planned.

Mid-Continent Pipe Lines, Ltd., 1500-mile, 30-inch crude, Edmonton to Chicago, planned.

Naphtha Israel Oil Co., 75 miles, 6-inch, gas, Rosh-Zohar field to Ashdod Yam on Mediterranean planned.

National Iranian Oil Co., 146 miles, 6 inch, crude, from Azna to Isfahan, Iran. $5 million, planned.

Northern Alberta Pipe Lines, Ltd., Edmonton, Alta., 110 miles, 10-inch, gas, main, Lac La Biche to Edmonton, $3 million, planned.

Northern Pipe Line Company, 153 miles, 16-inch, crude, from Regina, Saskatchewan, to Clearbrook, Minn., $10 million, planned.

Rhein-Donau Oletung, G.m.b.H, 185 miles, 24-inch, crude, Karlsruhe to Ingolstadt, $7.5 million, planned.

Peace River Oil Pipe Line Co., Ltd., 161 miles, 12-inch, crude, main line, Fox Creek to Edmonton, Alberta, planned.

Petroleos Mexicanos, 4, 6 and 8-inch, products, Mexico City-Puebla to Cuernavaca, planned.

1,240 miles, 34-inch, gas, Reynosa to Mexicali, Mexico, $160 million, negotiating with Tennessee Gas Pipeline Company for design and construction of the line.

360 mile, 12-inch, products, Minatitlan to Puebla and Mexico City, planned.

Products, Guadalajara to Tepic, planned.

Products, Aguascalientes to Zacatecas, planned.

6-inch, products, Guaymas to Ciudad Obregon, considered.

8-inch products, Guaymas to Hermosillo, considered.

Gas, Ciudad Carmen to Ciudad Pemex.

8-inch, crude Comalcalco to Minatitlan.

Crude, Minatitlan to Salina Cruz, contingent on proposed refinery on Pacific Coast.

149 miles, 10-inch, products, Ciudad Pemex to Minatitlan, planned.

181 miles, 4-inch, products, Mexico City to Salamanca, planned.

Pipelines of Puerto Rico, Inc., 95 miles, 8-inch, products, Penuelas to San Juan, Puerto Rico, approved.

Quebec Gas Transmission Lines, Inc., Montreal, 300 miles, gas, main, Quebec to Montreal, planned.

Rangeland Pipe Line Company Limited, 111 miles, 8-inch, crude, southeastern Alberta to Calgary, $3 million, planned.

Royalite Oil Co. Ltd., 26 miles 4-inch, products, in Alberta, authorized.

Saskatchewan Power Corp., 179 miles, 4-6-8-inch, gas, planned.

Societa Nazionale Metanodotti, 650 miles, 18-inch, crude, Genoa to Milan-Cremona-Torino, Italy, and Aigle, Switzerland, with extension to Karlsruhe and Munich, Germany, contract let on Italian portion to Saipem.

Societe du Pipe Line Sud-European, Paris, 432 miles, 34-inch, crude, port of Lavera to Strasbourg, with lateral extending 40 miles to Karlsruhe, Germany, underway.

Soc. Siciliana Metanadotti, gas line from Hassi R'Mel field in Algeria through Tunisia, across Mediterranean to Sicily and into Italy, considered.

Soc. Trapil, 200 miles, 12-inch, crude, La Havre to Paris, France, planned.

Standard-Vacuum Oil Company, 60 miles, 8-inch, gas, main, in South Sumatra, considered.

Ste. d-Etudes de Pipeline Intercontinetaux, Paris, 1,400 miles, 30-40-inch, gas, from Hassi R'Mel field in central Algeria across Mediterranean, through Spain, France and into West Germany, considered, Fish International Corporation making engineering and feasibility studies.

Sui Gas Transmission Co., Multan, Punjab, India, 145 miles, 8-inch, gas, from Sylhet to Dacca, East Pakistan, $9 million, considered.

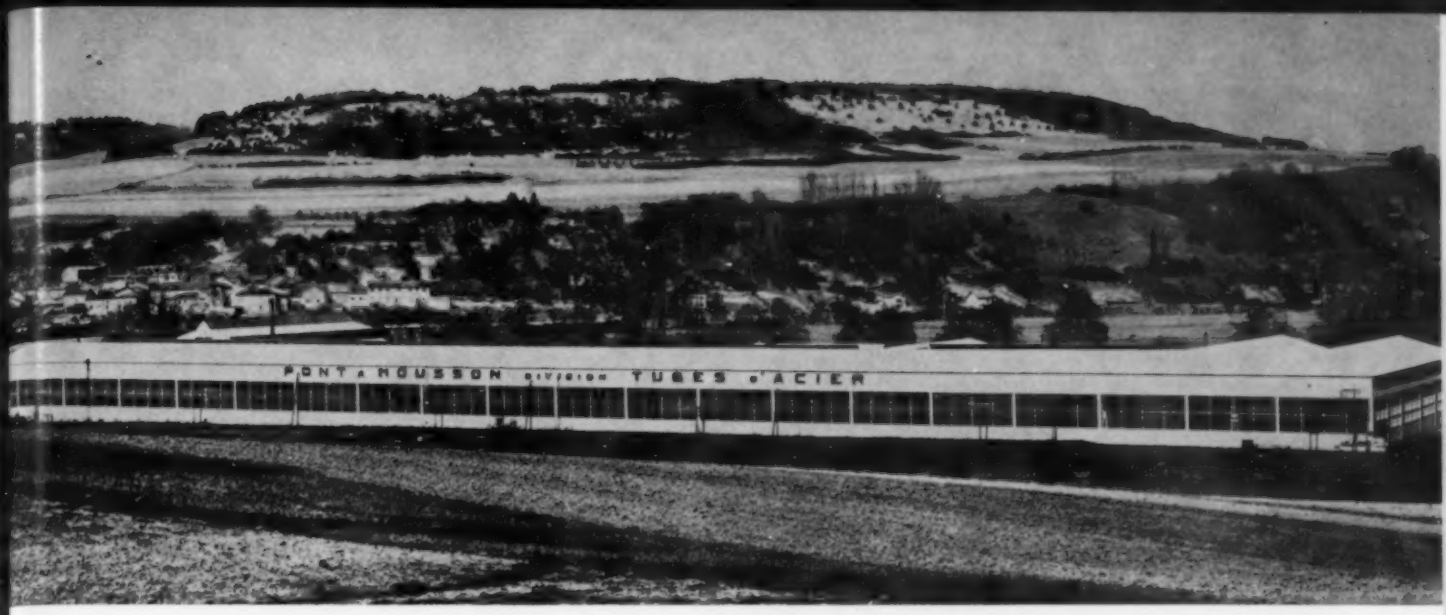
130 miles, 16-inch, gas, main line, Multan to Lyallpur, planned.

Syrian Pipeline, Damascus, 500 miles, crude, from Karshuk field, Syria, to Mediterranean, planned.

Trinidad and Tabago Electricity Commission, Trinidad, 42 miles, 16-inch, gas Penel field to Port-of-Spain, planned.

Trunk Pipelines Ltd., London, 70 miles, products, Canvey Island to Denham, Buckinghamshire, bill before Parliament. Extension of line from Denham to Birmingham, planned.

Yacimientos Petroleos Fiscales Argentina, Buenos Aires, crude line between Mendoza and Buenos Aires, considered.



General panorama of the Belleville mill of Pont-à-Mousson.

FRENCH STEEL PIPE INDUSTRY *EXPANDS TO MEET NORTH AFRICAN NEED*

The booming French steel pipe industry, already taking giant strides as the Sahara yields new oil potential, got new impetus in spite of the North African crisis.

Following the outbreak of violence in Bizerte in July, the Tunisian government cut the oil flow from Edjeleh. In response, French petroleum interests decided immediately to construct a new pipe line connecting the C.R.E.P.S. eastern Sahara fields with the existing pipe lines that run through Ohanet and Hassi-Messaoud, and thence to the Mediterranean.

The project had been on the drawing board, but scheduled for the indefinite future. The Tunisian flare-up, within the span of a few hours, brought the decision to get the work under way without delay.

Urgent orders were placed in early September with the Belleville Plant of the Société des Fonderies de Pont-à-Mousson, a major French pipe and tube manufacturer which at this time was supplying pipe for the eastern European pipeline complex "Lavera-Strasbourg."

The firm's production team were asked if the short delivery dates for the huge order could be met. Back came the response: "Can do!" This confident answer is typical of the production power and resources of the steadily growing French steel pipe industry. For example, the Belleville plant which makes welded pipe is but one division of the Société des Fonderies de Pont-à-Mousson. Internationally known, Pont-à-Mousson is a major holding Company with extensive interests in coal mining, steel mill and pipe founderies, in addition directs pipe-laying and construction companies in 15 other countries. Its specialization in steel pipe and tube manufacture and construction has won it a special international recognition as a major supplier of facilities for volume transport of petroleum and gas by pipeline.

In the Common Market, Pont-à-Mousson controls the HADIR Company which manufacturers small diameter welded pipes in Luxembourg; in Germany, the Halberghütte Company for oil pumps and compressors; in France and in the oil and gas fields, PONT-A-MOUSSON directs — through its subsidiary SIDELOR — the seamless steel-pipe plant at Déville-les-Rouen, the most modern mill in Europe. This plant manufactures all sizes of seamless steel pipes from ⅓" to 10¾" in all grades of steel recognized by the American Petroleum Institute. Ductile iron pipes, used by a majority of French Tanker fleet, were first manufactured in Europe by the PONT-A-MOUSSON complex. In welded pipe the production line at the Société des Fonderies in Belleville provides tubes from 16" to 42", generally in X52 steel, and also in other grades of steel if necessary.

Belleville additionally finds itself working with many special orders. For example, boiler pipes with diameters up to ten feet.

The plant at Déville-les-Rouen for seamless steel pipes is modelled after American prototypes. However, the Belleville mill follows the successful patterns established in other Pont-à-Mousson plants in Europe.

The plant's modern Research Center guided the selection of the special steel for the cross-Mediterranean pipeline. A major pipe-laying Company of the Group: EAU et ASSAINISSEMENT-SOCOMAN is closely studying applications in this particular field.

Of necessity, much production equipment on the pipe production line at Belleville is originally designed. It

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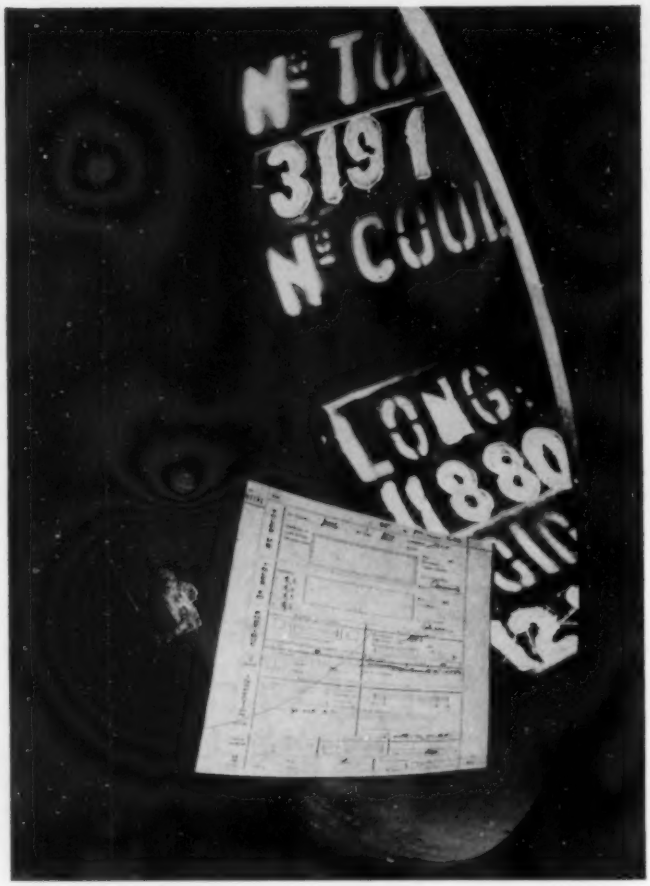

Précise quality control by the specific identity card which follows each tube through the production line and on which is noted specifications and control test data.

employs a high degree of automation and the long steel plates are folded, curved into a "C" shape then pressed in the final "O" before welding with remarkable facility. The inner welding is controlled on a TV screen filmed by the camera's lens at the welding head. Outside welding is done under the guidance of a light signal, also with automatic ease. Both ends of the tube are then cut with a blow torch and then hydraulically expanded into final shape. The final operation—end facing and bevelling—follows and a pipe is born.

The plant is equipped to provide the various protective coating processes, inner and outside, to customer specifications. Unusual mechanical and boiler shaping equipment are also part of the plant's facilities. Rigid inspections afford good quality control, and out of one 60-employee shift, as example, 18 persons are engaged in quality control operations. Inspectors wear green uniforms to distinguish them from the production men wearing blue. Total output of this one 60-man crew per shift is roughly one mile of steel tubes. Each control point finds several inspectors who select tubes at random from each run of 50 tubes. These samples undergo a rigorous pattern of tests designed to confirm tensile strength, welding efficiency and the stress placed on the metal by the folding and bending operations. These tubes are of course deleted from the production run, but serve their purpose in affording a constant spot check of the production run.

On reaching the inspection shop, the steel plate is subjected to a wide range of tests: ultrasonic, various and special measurements. The tube is identified, marked and then gets its "identification card" which stays with it right up to finishing point.

New testing methods utilizing advanced ultra-sonic techniques are applied for the second time to welding points prior to final X-Ray control.

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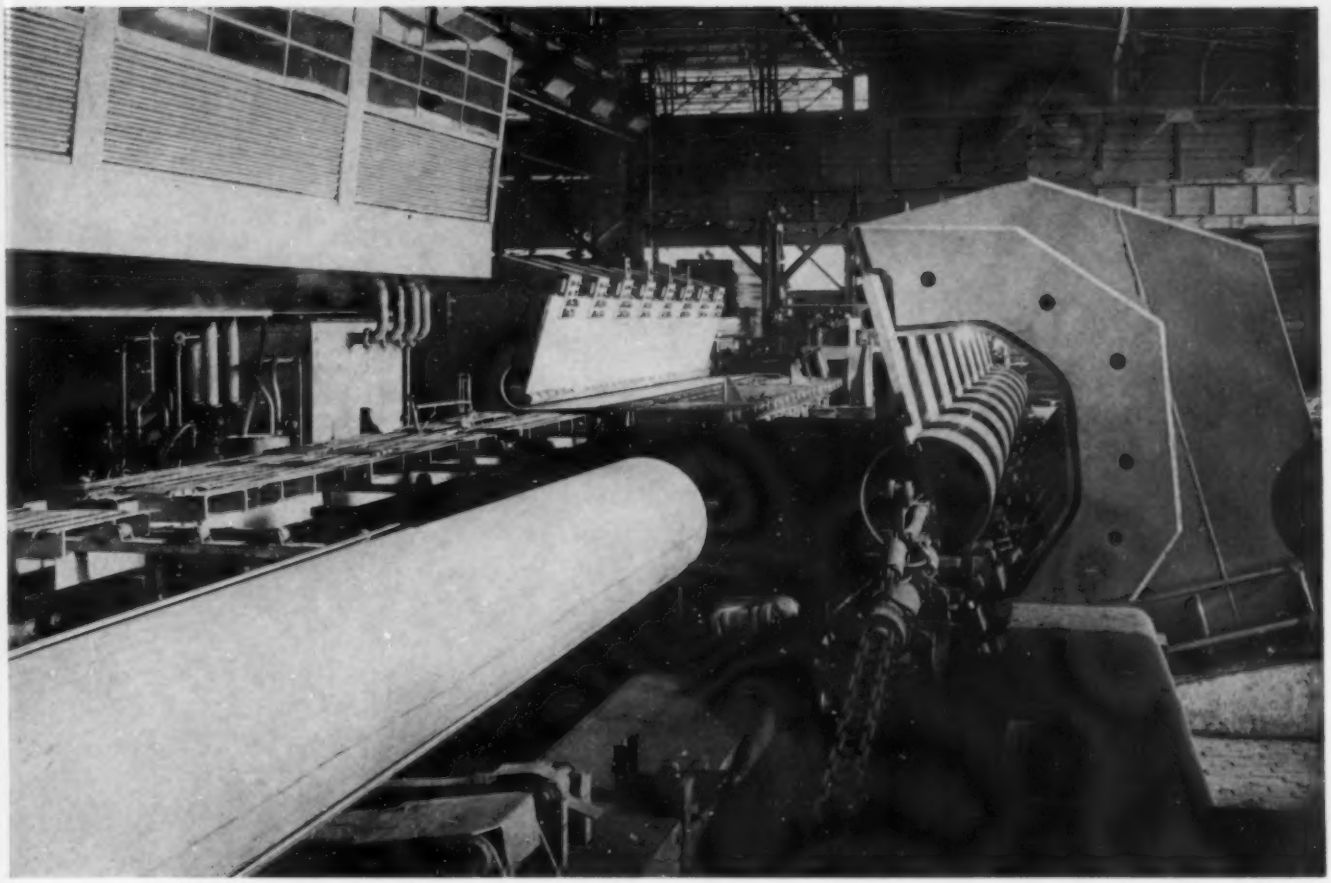

Automation guides the shaping and bending of flat steel plates into circular tubes ready to weld. The "C" shaping operation (center rear) preceeds the final "O" shaping operation at the right (ϕ 16 to 42").

Following the welding operation, the tube again undergoes ultra-sonic examination. Even slight faults call for an X-Ray and eventual return for semi-automatic repair. The final test during production is hydrostatic pressure control, following expansion of the tubes according to A.P.I. specifications.

M. PIERSON, Plant Alternate Manager states that "It is barely possible that a defective tube might leave our plant but hardly probable."

Even after the tube is finished, another series of inspection operations begins: the ultra-sonic welding test, using still more sensitive testing equipment, then systematic X-Rays for *all* tubes and, finally, special testing of doubtful spots disclosed during ultra-sonic tests. Dimensional inspection also takes place before delivery of the tube.

"As a matter of fact, the Official A.P.I. certificate which hangs in my office is a continuing challenge to us not only to meet the basic approved A.P.I. standards, but also to surpass them in many cases."

These strict control standards have paid off, and have won the respect of foreign competitors. "American or Russian Technicians who visited our plant have been greatly impressed by the extent and quality of our controls" adds Plant Manager, Monsieur SOGNET.

MR. CLEMENTZ, Head of the Societe des Fonderies de Pont-A-Mousson said also: "We try to keep inspection measures at peak efficiency. Perhaps as a result our tubes are found on all lines constructed in the Sahara and in France since 1957, when our production first started. Also, and this is equally important, we keep our prices competitive.

"As an important link in the chain of Companies involved in pipe work production under the Pont-A-Mousson Label, the welded pipe plant at Belleville should play a major role in the petroleum and gas industry. Indeed we are awaiting a considerable expansion of pipe transportation especially in the oil, gas and raw and finished product categories."

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What's Happening

among MEN in the INDUSTRY

Humble Pipe Line Company has promoted **Wayne T. Corley** to assistant area manager of the Midland, Texas area effective January 1. Corley presently is on loan serving as general manager for construction of the **West Shore Pipe Line Company.** Prior to that assignment, Corley was assistant chief engineer of **Interstate Oil Pipe Line Company,** which merged with Humble this year. He joined the company in 1946 and became assistant chief engineer in 1956.

The **Marathon Pipe Line Company** has named **K. E. Tappy** manager of the Rocky Mountain region. He had been manager of the Company's Great Lakes region.

Tappy succeeds **M. L. Stanfield** who recently was appointed vice president and director of the company. **C. E. Bell,** presently superintendent of the Eastern Crude Oil Pipe Line district in Great Lakes region, became manager of the region. **F. A. Moore,** formerly acting assistant manager of the Rocky Mountain region, was named assistant manager of the region. Tappy joined the **Ohio Oil Company** in 1933 as an assistant fireman at the Ferry station near Bluffton, Ind.

Robert V. Faith has been appointed Kansas superintendent for **Cities Service Pipe Line Co.** He succeeds **W. W. Dulany,** who has retired after 44 years service with Cities Service.

Faith joined the company in 1953. He became district engineer at El Dorado for the pipe line company in 1957.

John R. Giese

Paul Guarin

John R. Giese has been named chief consultant engineer and **Paul Guarin** was named senior consultant engineer for **Gulf Interstate Engineering Company.** Giese was supervisor of economic studies for Great Lakes Pipe Line Company for the past five years. Guarin has been performing independent consulting engineering work for several major oil companies in South America, the Middle East and Far East for the past seven years.

Charles L. Cover has been named LPG sales coordinator for **Humble Oil & Refining Company** in the new headquarters marketing department in Houston. Cover formerly served as LPG and asphalt coordinator in Esso Standard's petroleum specialties department. He joined Esso in 1938.

Donald M. Cox, Humble Oil & Refining Company coordinator of supply and transportation, will join Esso A.G., German affiliate of Standard Oil Company (N.J.).

Cox will be a member of the board of directors with the company in Hamburg. He has been with Esso since 1943.

Representative **Frank Ikard,** D-Texas, has been elected executive vice president of the American Petroleum Institute. Ikard has represented the 13th Congressional District since 1951.

Frank Rivers has joined **Northern Natural Gas Company** as director of the rate and tariff department. Rivers had served as manager of the rate department for the Texas Gas Transmission Corporation. He has served two years as an employe of the Carolina Power and Light Company in South Carolina. Previously he was with the United States government for 15 years in the utility regulation field — 14 of those years with the Federal Power Commission.

Frank Rivers

Paul B. Ridlon has been promoted to division superintendent of **Cities Service Pipe Line Co.** He will be in charge of operations in Kansas, Texas and Louisiana.

R. P. Hamilton has been appointed president of **Dixie Pipeline Company.** Formerly president of Southeastern Pipe Line Co., he had been elected a member of the Board earlier. **Ralph P. Dougherty,** formerly with Minnesota Pipe Line Company, was named a vice president.

Hamilton succeeds **F. B. Neptune,** executive vice president of **Phillips Pipe Line Co.,** who served as president during formative stages of the company. The directors also announced that the company's headquarters will be in Atlanta.

R. Y. Patterson, Jr., has been appointed general attorney for **Houston Texas Gas and Oil Corporation, Coastal Transmission Company, Jacksonville Gas Corporation, Florida Gas Utilities Company,** and their parent firm **The Houston Corporation.**

Patterson has been associated with the company since being appointed assistant secretary and treasurer in 1959.

Hill Hubbell Company has elected **Robert J. Young** president. **Milton M. Bowen,** who was named president in 1960, retired, but will remain as a consultant and director. Young has been vice president and general manager since 1960. He has been with the company for 25 years.

Natural Gas Pipeline Company of America has appointed six new officers and assigned new duties to a vice president. **Wayne Simpson,** vice president and comptroller, resigned as comptroller and becomes head of finance. **Nathan L. McClure** was elected comptroller. He had been assistant comptroller. **Charles G. Freund** was promoted from assistant secretary to secretary. **Harvey S. Cain** moved up from assistant comptroller to treasurer. **James L. Martin** was administrative assistant to secretary and treasurer and now is assistant secretary. **Martin M. Saidikowski** advances from general superintendent of the Accounting Division to assistant treasurer. **Robert C. Bryan** becomes assistant comptroller. He had been chief auditor. The late **James A. Laing** had been secretary and treasurer. He died October 25 in Chicago.

Wayne Simpson

A joint Danish-American company, **Nordisk Gulf-Gas A/S,** was formed during a meeting of shareholders at Esbjerg, Denmark last month. The company will acquire propane, butane and liquid petroleum gas business of **Nordisk Flaskegas A/S** now operating in Denmark. **Gulf Oil Corporation,** through its subsidiary **Warren Petroleum International Corporation,** holds an interest in the company. Gulf's Stigsnaes, Denmark refinery, now under construction, will be the main source of supply.

Elected directors were **Holger Gronne, E. Riber Bertelsen,** and **H. A. Wegeberg,** representing Danish stockholders; and **W. J. Woodger, Jr., Albert Gregersen,** and **Arve Nilsen,** representing Gulf-Warren interests.

Marvin Chandler, president of **Northern Illinois Gas Company,** and a vice president of American Gas Association, has been named chairman of board of trustees of the Institute of Gas Technology. Chandler replaces **Everett H. Tollefson,** president of Consolidated Natural Gas Co., who declined to accept another term after serving three years as chairman. He remains a member of the board's executive committee.

American Meter Company's president, **William G. Hamilton, Jr.,** was re-elected trustee and made a member of executive committee. **Lester Armour,** vice chairman of Harris Trust and Savings Bank, was named to both board and executive committee. Other new board members include **Jack V. Richards,** vice president, **Public Service Gas and Electric Co.,** and **William P. Woods,** president, **Washington Natural Gas Co.**

Lyle H. Brandt, division gager at Pauls Valley, Okla., for **Service Pipe Line Company,** has been transferred to Rawlins, Wyo., Brandt will assume duties of divi-

sion gager in Sterling, Colo., and Rawlins districts of Service's Wyoming division.

Holly P. Bradley, safety supervisor for **Service Pipe Line Co.,** has been elected for a three-year term to the executive committee of the American Society of Safety Engineers. Bradley has been a member of the society since 1945 and served as a regional vice president.

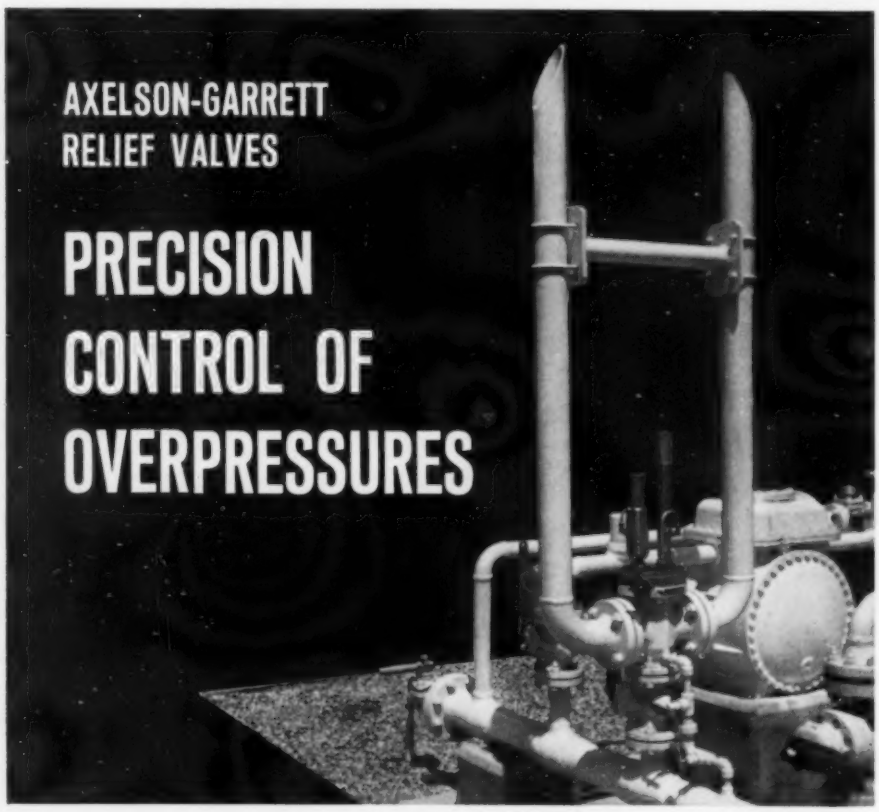
Deaths

James A. Laing, 61, secretary and treasurer of Natural Gas Pipeline Company, died October 25, in Chicago. Laing had been with the company since 1953. He became secretary in 1957 and treasurer in 1960.

Jack Hodges, 57, general superintendent for Western Pipe Line Inc., died October 7 in Ohio after a heart attack. Hodges formerly had been with J. P. Neill & Company.

Forrest Merrill Benson, 66, retired building manager for Service Pipe Line Co., died October 6. He joined Service in 1949 and retired in 1960.

Lewis McDonald, 77, retired vice president of Chicago Bridge & Iron Company, died October 20 in Chicago. He had been with the company over 44 years when he retired in 1954.



Why take chances on overpressure damage to lines and vessels when you can have positive protection with Axelson-Garrett Pressure Relief Valves.? Dependable and automatic, they relieve, blow down and reseat within extremely close limits . . . often within 1% of system operating pressure . . . available in operating range of 25 to 6,000 p.s.i.

Changing conditions are no problem either, as the controls can be set externally with exactness and will maintain accuracy of set and reset pressure over unlimited cycles, with no pressure accumulation. There is a bonus in maintenance savings, too . . . Axelson-Garrett Relief Valves do not "chatter" or "simmer" . . . fast, positive opening eliminates wear on valves and seats.

Check with your Axelson-Garrett representative or write direct on how you can add these economical safety valves to your installation . . . ask for bulletin #RV.

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DIVISION OF U.S. INDUSTRIES, INC. GENERAL OFFICES: LONGVIEW, TEXAS

WHO'S MEETING WHERE

December

Interstate Oil Compact Commission, annual meeting, Denver Hilton Hotel, Denver, December 4-6.

1962

January

Pipe Line Contractors Association, annual convention, Boca Raton Hotel, Boca Raton, Florida, January 7-10.

NACE, Canadian region eastern division conference, King Edward Hotel, Toronto, January 17-19.

Natural Gas Processors Association, Gulf Coast regional meeting, Robert Driscoll Hotel, Corpus Christi, Texas, January 19.

February

Distribution Contractors Association, annual meeting, Muehlebach Hotel, Kansas City, Mo., Feburary 5-7.

Pipe Line Contractors Association of Canada, Castle Harbor Hotel, Bermuda, Feb. 14-17.

Southwestern Legal Foundation, annual institute on law of oil, gas and taxation, Southwestern Legal center, Dallas, February 15-17.

Natural Gas Processors Association, South Louisiana regional meeting, Lafayette Petroleum Club, Lafayette, La., February 16.

March

Southwestern Legal Foundation, conference on economics of gas industry, Southwestern Legal Center, Dallas, March 1-2.

Ohio Oil and Gas Association, winter meeting, Deshler Hilton Hotel, Columbus, Ohio, March 2.

ASME, gas turbine-process industries conference, Shamrock Hilton Hotel, Houston, March 4-8.

Natural Gas Processors Association, Oklahoma region meeting, Sheraton-Oklahoma Hotel, Oklahoma City, March 16.

NACE, 18th annual convention, Municipal Auditorium, Kansas City, Mo., March 19-23.

New England Gas Association, annual meeting, Statler-Hilton Hotel, Boston, March 22-23.

ASME, power conference, Sherman Hotel, Chicago, March 27-29.

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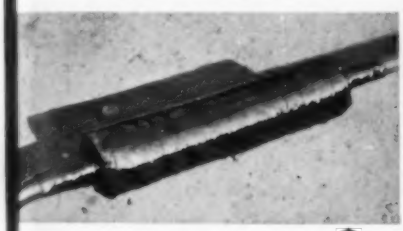
NATURAL GAS lines at compressor and meter stations give years of maintenance-free service when protected by TAPECOAT, the coal tar coating in handy tape form.

GAS DISTRIBUTION lines of large diameter can readily be protected with TAPECOAT to withstand the abrasive and corrosive climate in underground service.

Lines in **OFF-SHORE DRILLING** operations need joint protection equivalent to the mill-wrapping on the pipe. TAPECOAT is most economical because it gives lasting protection in underwater service.



ABLE AND CABLE SPLICES in communications service are effectively and economically protected by TAPECOAT.

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PORT FUEL LINES need quality joint protection as-d by TAPECOAT. It is easy pply by spiral or "cigarette" ping depending on the size e pipe. No training needed.

STEEL MILL water lines in this new plant are joint-protected with TAPECOAT. TAPECOAT can be used to advantage to protect any steel surface in underground service, as proved since 1941.

Lines buried in cinders in **RAILROAD YARDS** need the sure protection provided by TAPECOAT. There's a size for every purpose from 2" to 24" in width.

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What's Happening among SERVICE and SUPPLY MEN

J. V. Kidd

Monte Leath

F. H. Maloney Promotes Joe V. Kidd To Assistant General Sales Mgr.

Joe V. Kidd has been appointed assistant general sales manager and director of technical services for the F. H. Maloney Company. Monte D. Leath has been named comptroller of the company and J. L. Griffith has joined Maloney's technical services department.

Kidd joined the company in 1958 as a sales engineer. Leath had been an economic analyst for Texas Eastern Transmission Corporation. Griffith had been with Wyatt Industries.

Hills-McCanna Appoints Zellers Regional Manager

William A. Zellers has been appointed Southwest regional sales manager for Hills-McCanna Company. J. Carl Hall has been named special products manager for the firm.

Zellers will be located in Houston.

W-K-M Appoints Douglas Pierce Industrial Relations Director

Douglas F. Pierce has been named director of industrial relations for the W-K-M division of ACF Industries, Incorporated. He joined the company in 1959 as labor relations manager. He also had served as ACF's assistant manager of labor relations in New York.

Parsons Named Supervisor By Minneapolis-Honeywell

Alonzo R. Parsons has been named sales supervisor for scientific products in Eastern region for Minneapolis-Honeywell Regulator Company. Parsons joined the company in 1947 as an application engineer. Recently he was appointed vice president of District 1, Instrument Society of America.

John W. Collins Named Walworth Company President

John W. Collins has been elected president of Walworth Company. Collins is also president of Walworth's subsidiary, Grove Valve & Regulator Company and he will continue as head of that company. Collins has been with Grove for 18 years and served as treasurer, senior vice president and president.

John W. Collins

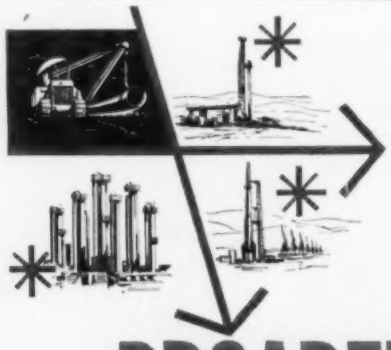
In his new position, Collins will relocate at Walworth's headquarters in New York City.

CF&I Appoints M. R. Harbour Assistant District Sales Manager

Marvin R. Harbour has been named assistant district sales manager for the Colorado Fuel and Iron Corporation's Portland district. Harbour has been with CF&I since 1953 when he joined the company as a sales representative in Fort Worth. In 1959, he was transferred to Portland.

Case Elects M. W. Reid Vice President-Marketing

Morris W. Reid has been named vice president-marketing for J. I. Case Company. He joined Case in 1958 as assistant Canadian sales manager in charge of Western Canada.



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The work of Burden in the North American Pipe Line System Construction field is well known. With the broadening of the world petroleum and gas industry Burden has been actively engaged in work abroad and is now in position to contract for work anywhere.

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PIPELINE CONSTRUCTION AND RECONDITIONING
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INTERNAL PIPE COATING CONTRACTOR

Wishes a Merry Xmas and a Prosperous New Year to its many friends in the pipe line business.

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You can add Unicor at any point in your operation. You don't need to add much . . . only 10 to 20 parts in a million parts of petroleum distillates. This potent, oil-soluble additive then plates out a molecular film on the inner surfaces of pipelines, refinery vessels and tanks . . . provides lasting protection against corrosion . . . and safeguards the quality of your products against contamination.

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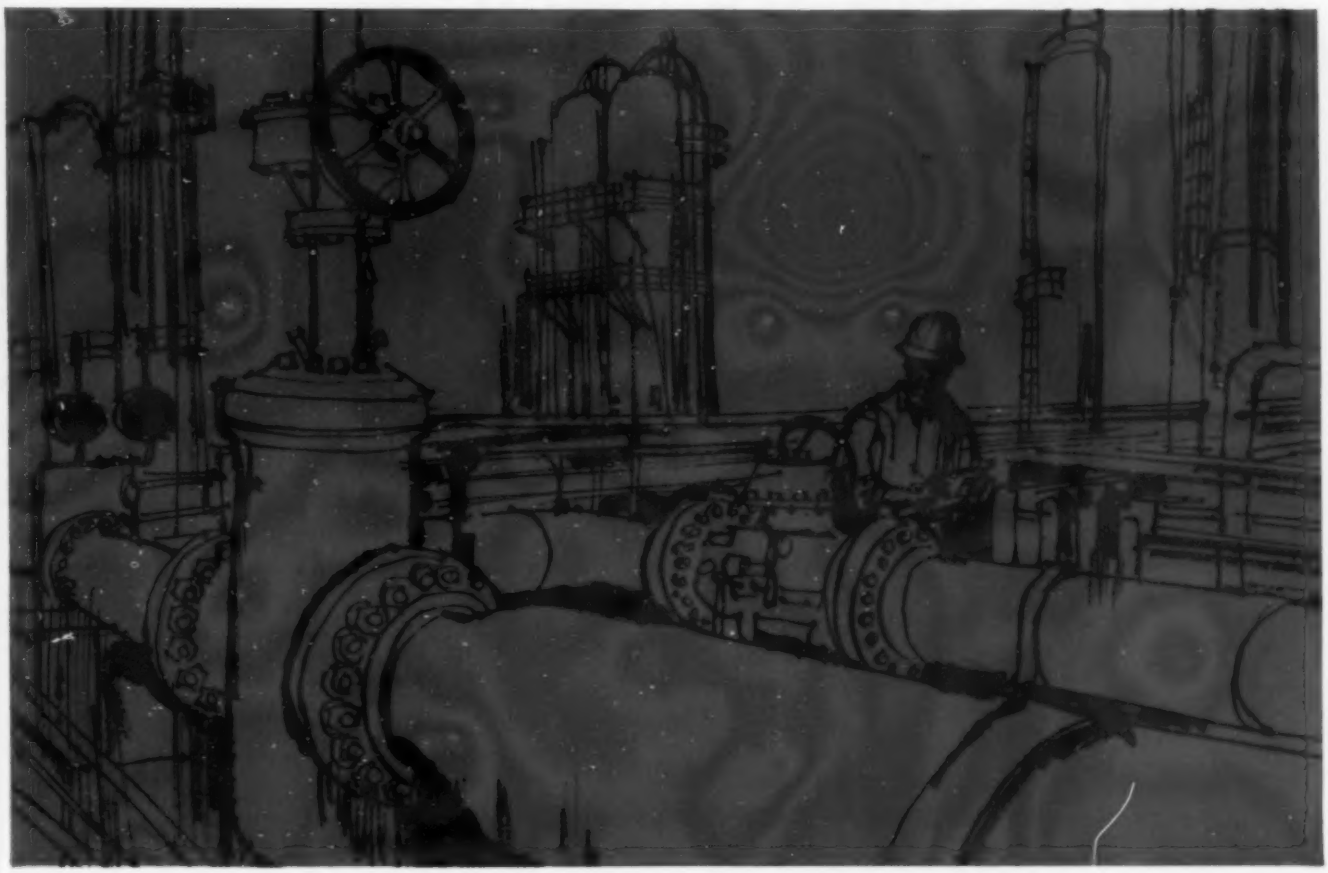


The Hallmark of Quality Coating and Wrapping

Since early times, fine craftsmen have affixed hallmarks to their products as evidence of the quality of materials and workmanship that were used. The workmen at Standard Pipeprotection Inc. are fine craftsmen, too. And Standard Procedures carefully protect every step of coating and wrapping your pipe assuring you that the finest materials and workmanship have been used throughout its processing. As evidence of this top quality, Standard Pipeprotection Inc. affix their hallmark of quality coating and wrapping to the kraft wrapper of your pipe.

standard pipeprotection inc.

3000 SOUTH BRENTWOOD BLVD. • ST. LOUIS 17, MISSOURI

Noller Control Systems Announces Two Directors

Herbert I. Dunn and Wm. Maxwell Wood have been named directors of Noller Control Systems Inc. Dunn is partner of Schwabacher & Co. of San Francisco and Wood is vice president and director of Schwager-Wood Co.

American Measurement & Control Appoints Ezekiel General Manager

Dr. Frederick Ezekiel has been named general manager of American Measurement and Control Inc., a subsidiary of CompuDyne Corporation. He formerly was director of research, and succeeds Donald G. O'Brien who remains a consultant and director of the parent firm.

Knight Manufacturing Forms Compressor Services, Inc.

Compressor Services, Inc., has been formed to rent, lease and service skid-mounted compressors. It is a wholly owned subsidiary of Knight Manufacturing and Supply Co.

Dean B. Knight is president and Sam L. Bewley vice president of the new company.

Lamar Elected President Of Southern Pipe Division

C. E. Lamar has been elected president of Southern Pipe Division of U.S. Industries, Inc. He succeeds D. A. Stromsoe who has retired.

Lamar who joined the company in 1951, had been executive vice president of Southern. Stromsoe will remain a consultant.

Beckman Instruments Names Stankey Product Line Manager

Robert E. Stankey has been appointed product line manager for the scientific and process instrument division of Beckman Instruments, Inc. Stankey joined the company in 1960 and now will be located in Fullerton, Calif.

James E. Tebay has been appointed eastern regional sales manager for Beckman with offices in Mountainside, N. J. He has been with Beckman since 1956.

Harry Neugold Jr., Named E. R. P. General Manager

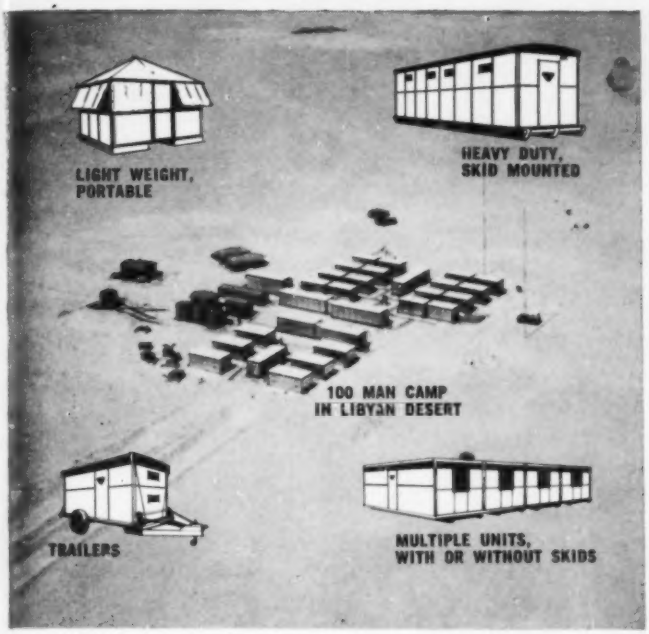
Harry Neugold, Jr., has been appointed general manager of Electro Rust-Proofing Corporation. He has been with E. R. P. since 1952 and was appointed Northeast Division engineer in 1956. He has been the company's chief engineer and assistant general manager since early 1960.

Henry Pratt Co. Announces Several New Appointments

Henry Pratt Company has appointed W. J. Woolley vice president and general manager—Plate Division and Robert P. Saar vice president-Manager—engineering. Other Pratt appointments include Robert C. Beckwith named manager—manufacturing engineering; Henry C. Schwenk, manager—marketing; and Robert Blair was named research chemist.

Solar Aircraft Company Appoints M. Stuart Loop

M. Stuart Loop has been appointed Solar Aircraft Company sales engineer for company's office in Atlanta, Georgia. He is responsible for gas turbine and related turbomachinery sales.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HEAVY DUTY, SKID MOUNTED
100 MAN CAMP IN LIBYAN DESERT
TRAILERS
MULTIPLE UNITS, WITH OR WITHOUT SKIDS

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Fast delivery • Save up to 80% on freight • Skid or wheel mounted • World's leading camp outfitters • Write:

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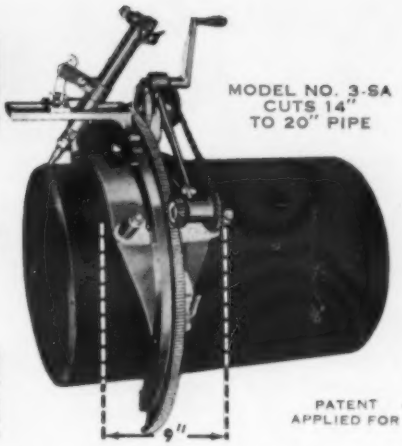
NEW!



FEATURING BALANCED RING GEAR-SADDLE ASSEMBLY!

LIGHTER WEIGHT! EASIER TO USE!

MOUNTS AND CUTS ON SHORT LENGTHS OF PIPE!

- It's extremely lightweight.
- It's easier to handle and operate with the new balanced design.
- Requires only ½ the storage space of competitive pipe beveling machines.
- Can be operated on shorter lengths of pipe for seating the machine and cutting, making it more versatile.
- More rugged . . . this new design produces a more stable ring gear assembly, which is less likely to spring or warp.
- Retains extreme accuracy of cuts, which all Mathey Pipe Beveling Machines are noted for.
- Available in all sizes, from No. 1 to No. 5 machines.

Call or Write for Further Information or Demonstration.

C. A. Mathey MACHINE WORKS, INC.

212 S. Frankfort Tulsa, Okla. • Box 1159 • LUther 7-3311

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handles all sizes of pipe—6 inches and up!

One C-R-C IMCO Pipe Beveler and cutting torch with a complete set of bands handles all sizes of pipe from 6 through 60 inches standard • Makes perfect, complete square cuts • cuts out-of-round pipe without additional attachments • flexible drive shaft permits safe operation • fast set-up—simple operation—easy to store or transport.

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For more data on advertised products, use cards, last page.

J. F. Herold

C. K. Vincent

Porta-Kamp Manufacturing Co. Appoints Two Vice Presidents

Clarence K. Vincent has been appointed vice president of manufacturing and John F. Herold vice president in charge of sales for Porta-Kamp Manufacturing Company. Both will be located in Houston.

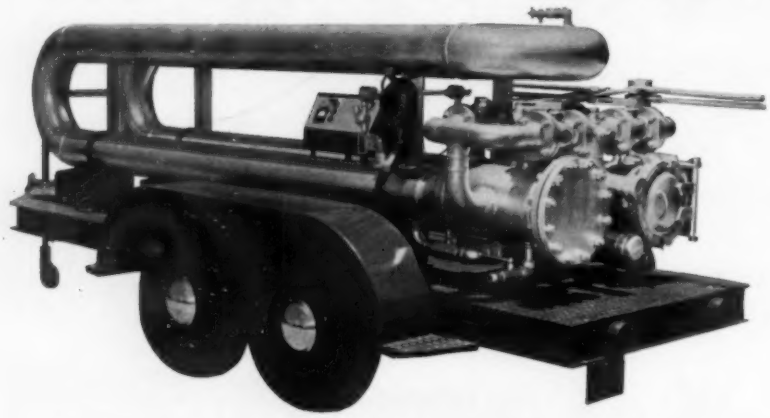
Vincent has beeen with the U.S. Treasury Department where he worked with bond promotion and he also had experience in the field of securities and direct mail. Herold has been export manager for Baroid Sales and vice president of Herold Packing and Herold Supply.

Electrodynamic Instrument Corp. Names Schneider Engineering Mgr.

William P. Schneider has been appointed manager of engineering for Electrodynamic Instrument Corporation. He will direct the company's engineering research and design programs in the fields of geophysical instrumentation, electronic components and subsystems, and oceanographic instrumentation.

POSITIVE DISPLACEMENT

METER PROVERS



Maloney's Bi-Directional Trailer-Mounted Meter Prover . . .

. . . is the latest solution to fast, accurate liquid meter proving. Ideal for proving LACT or other widely separated meters, this portable prover is precision-built under constant engineering supervision, calibrated and certified. The rugged-built trailer meets ICC safety requirements and provides maximum mobility on highways and on rugged terrain.

Maloney meter provers offer:

Speed . . . One operator can prove an LACT unit in 15 or 20 minutes.

Accuracy . . . The majority of Maloney provers have experienced from .01 to .02 of 1% repeatability.

Ease of Operation . . . Meters are proved on stream under true operating conditions using actual line fluid. No prover tanks are necessary.

Economy . . . Savings are realized in the amount of time and number of personnel necessary to prove meters and in the expense of the equipment needed.

The trailer-mounted prover is one of five standard models built by the F. H. Maloney Company. Others are the Skid-Mounted Bi-Directional, the U-Bend, the Interchange and Loop Assembly, and the Interchange Unit. Also, the Maloney Company can design and build provers to meet other particular specifications. The Company has an Engineering Design Service to solve meter proving problems, including those of design, fabrication, or installation. For a complete description of Maloney Meter Provers and Design Service, please write the Company's Houston office for Bulletins MP-1 and MP-2.

"Since 1932 Precision in Rubber—Metals—Plastics"

F. H. MALONEY COMPANY

P. O. BOX 1777 / HOUSTON, TEXAS

OFFICES IN LOS ANGELES • PITTSBURGH • TULSA

F. H. Maloney COMPANY

Grove Valve & Regulator Co. Appoints Webb Sales Engineer

Victor H. Webb has been appointed sales engineer for Grove Valve & Regulator Company. He will be headquartered in Grove's Corpus Christi, Texas office.

Clint A. Redd has been appointed product manager—valves for Grove. He will supervise sales of Grove's full line of valves. He had been with W-K-M division of ACF Industries.

Paul Radue Joins Lynch As Application Engineer

Paul F. Radue has joined Lynch Communications Systems Inc., as an applications engineer in the marketing division. He will work in product planning, microwave system engineering and carrier application engineering. He had been planning engineer with ITT Kellogg before joining Lynch.

Warren Named Sales Manager For Chicago Bridge & Iron Co.

R. W. Warren has been named manager of sales for Germany, Holland and Italy for Chicago Bridge & Iron Company. Formerly located in CB&I's foreign sales department in New York, Warren will be headquartered in The Hague, Holland and later will establish an office in Germany.

He has been with the company since 1949.

Stupp Corporation Appoints Harmon Cutler Vice President

Stupp Corporation has promoted Harmon Cutler from plant manager at Baton Rouge to vice president. He will continue his duties as plant manager also. Cutler has been with Stupp since 1955 and became plant manager in 1961.

Oliver Corporation Buys Cletrac Tractor Business

Oliver Corporation has purchased the tractor business assets of Cletrac Corporation for $5.5 million. Oliver bought Cletrac's inventories, engineering and designs, and numerous machine tools.

Fisher Governor Co. Holds Gas Symposium

A three-day symposium on "High Pressure Gas Regulation" was held in October at Fisher Governor Company in Marshalltown, Iowa. Attending the meeting were 125 management and executive personnel of the gas transmission industry. Program included lectures by engineering and sales personnel of Fisher and presentation of papers and participation in panel discussions by 15 of the attendents.

W. L. Shoemaker, senior vice president of Northern Natural Gas Company, was keynote speaker who spoke on "Let's Bring the Future into Focus."

Gas men who participated in the program besides Shoemaker were E. N. Armstrong, Transcontinental Gas Pipe Line Corp.; E. J. Burgin, Houston Texas Gas & Oil Corp.; L. P. Emerson, Foxboro Company; Gilbert Estill, Oklahoma Natural Gas Co.; Paul M. Lankford, Southern Natural Gas Co.; D. H. Lindsey, Northern Natural; P. H. Miller, Texas Eastern Transmission Corp.; Orrin F. Nelson, Northern Illinois Gas Co.; J. R. Purvis, El Paso Natural Gas Co.; Harold R. Stauffer, Kansas-Nebraska Natural Gas Co.; C. H. Stiles, United Fuel Gas Co., and E. F. Trunk, Laclede Gas Company.

Strategically located plants give you the pipe coating protection you want!

When you want it..

Where you want it..

Whether you specify conventionally coated and wrapped pipe or X-TRU-COAT*, the broadest facilities and protection experience you can get are available from Pipe Line Service. Eight plant sites strategically located near pipe-producing sources give you fast economical delivery of your processed pipe when and where you want it. The very latest in new machinery and new processes adds the new dimension of X-TRU-COAT to PLS's protection flexibility. Unlimited production of X-TRU-COAT is now available at three plants: Sparrows Point, Md.; North Lima (Youngstown), Ohio; and Franklin Park, Ill. When you specify PLS, you get unparalleled quality and product uniformity. Contact the PLS office nearest you today.

*Pipeline Service Corporation X-TRU-COAT, Pat. Nos. 2,447,420—2,467,642
Produced under the Dekoron Process

Pipe Line Service Corporation

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Quality pioneers in pipe coating protection for more than 30 years

A SUBSIDIARY OF AMERICAN STEEL FOUNDRIES

What's New in EQUIPMENT

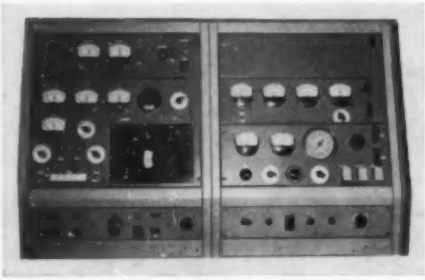
Pipe Repair Clamp

A wrap-around pipe repair clamp featuring bolts on one side and a thick, butt-seal rubber gasket has been introduced by Dresser Manufacturing Division.

Designated "Dresser 360 All-Around Clamp" the unit provides a ⅜-inch adjustment on diameter so that a single clamp will fit a large number of pipe diameters. It is designed for repair of holes, circumferential breaks or splits in industrial, slurry, process or water piping. An extra thick spanner plate supports the gasket so that pipes may be connected with as much as a one-inch gap between pipe ends.

The Style 360 clamp is available in nominal sizes from 2 to 12 inches; fitting pipes with O.D. from 2.38 to 14.50 inches. Clamp widths vary from 6 inches to 30 inches, providing a total of 268 different models available.

For more data, circle **No. E1** on Readers' Service Card, last page this issue.



Test-Calibration Console

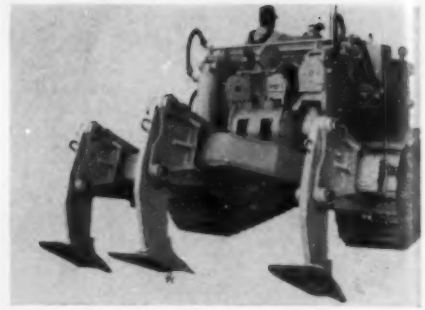
A self-contained test and calibration console for the ElectriK Tel-O-Set instrumentation line has been developed by Minneapolis-Honeywell Regulator Company. The console has four sections. One for use with recorders and indicators; a second for transmitters and transducers; a third for controllers, and the fourth for oscillators. Each section is complete; all or any combination of the four sections can be used simultaneously.

For recorders and indicators, console supplies regulated 115-volt AC power to the transformers of these units. Meters measure the 42-volt DC, +28-volt DC, —28-volt DC, dither and error signals. A 4-20 ma signal is generated for calibrating the display circuit. On transmitters and transducers, console supplies power for electric circuit and compressed air for pneumatic circuit in testing and calibrating pressure-to-current and current-to-pressure transducers. The console's controller section has a manual-automatic switching circuit similar to the recorder control station. Switching to automatic control generates an error signal and the controller's output is indicated on a meter. Three ferrite discs and detectors are built into console for oscillator checks. Current flow is measured on a console meter by switching various disc-detector combinations into the circuit connected to the oscillator board.

For more data, circle **No. E2** on Readers' Service Card, last page this issue.

New Rippers

Designed for Caterpillar D8 serial 14A and 15A tractors, the ATECO HR-D8D/29 rippers provide ample clearance for rear mounted No. 29 and 25 cable control winches. The American Tractor Equipment Corporation rippers accommodate up



to 3 straight or curved shanks. Maximum ripping depth for standard shanks is 24 inches. Special straight shanks reach 42 and 48 inches.

Features of these rippers include new steel swing brackets designed for added strength and ample tool beam clearance; stronger offset boxed tool beam of 1½-inch plate internally reinforced; and fender-mounted pump, tank and valve assembly.

(This item supplements American Tractor Equipment Company data on page 36 of the Pipe Line Catalog, Third Revision.)

For more data, circle **No. E3** on Readers' Service Card, last page this issue.

Welder—Power Plant

A gasoline engine driven welder/power plant powered by a 15 horsepower Onan air-cooled engine is now being offered by Miller Electric Manufacturing Company. Welder output is increased to 250 amperes —225 amperes at 100 percent duty cycle. Model provides 1 KW of DC while welding and, as a standby power plant, deliver 5 KW of 115/230 volt AC for running electric equipment.

New engine features include twin mufflers, automatic spark advance and rotators on all valves which, with valve seats, are now Stellite faced.

For more data, circle **No. E4** on Readers' Service Card, last page this issue.

Flow Meter Computer

This LPG flow measurement system corrects flow volume for variations of gravity and temperature with continuous readout of flow in barrels of LPG. Introduced by Computers, Incorporated it uses the orifice as the primary flow element and connects to transducers which detect temperature, differential pressure and specific gravity. Volume reduction is automatically calculated from built-in ASTM-IP tables.

The model 257 LPG computer has more

NOW...

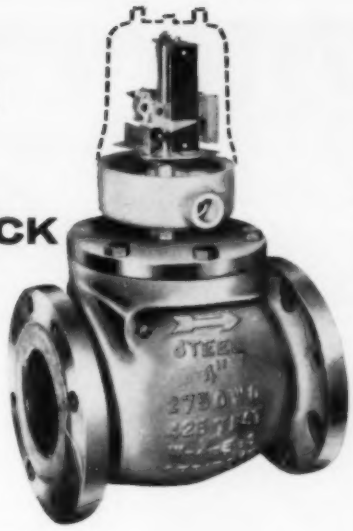
a full-flow

SWING-CHECK VALVE

AND

a FLOW SWITCH

BY



MAGNETROL® model FCV

DEPENDABLE AS THE PULL OF A MAGNET

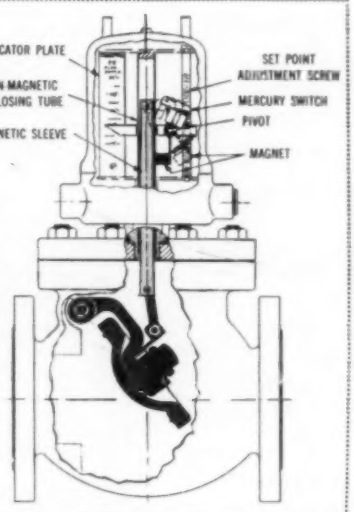
- Remotely Signals Flow–No-Flow
- Interlocks Safety Start-Up or Shut-Down
- Dial Adjustment of Switch Operating Point
- Seals Against Back-Flow

FOR PRACTICALLY ANY LIQUID, TEMPERATURE OR PRESSURE

The new Magnetrol FCV combines a swing check valve with an externally adjustable Magnetrol switch, calibrated for pre-set flow rates. It provides positive flow signal or control at any pre-set valve disc position within 15° to 55° of full closed position. Swing check valve also seals off back-flow — no need to isolate valve from line on shut-down or when changing tanks or lines. Full 90°-swing of disc permits passage of "pigs" or scrapers through line when handling various liquids in sequence, without interrupting flow. Explosion-proof housing, mercury-to-mercury switch contacts, or pneumatic pilot mechanism.

HOW IT WORKS

A magnetic sleeve, linked to the valve disc, is raised within a nonmagnetic pressure-tight enclosing tube as the disc swings in response to flow. This sleeve attracts or releases a permanent magnet attached to a mercury or pneumatic switch. By positioning the pivoted magnet higher or lower on the tube, switch actuation may be set for any point of disc swing within 15° to 55° of full closed position, according to calibrated indicator panel on the switch mechanism.



Mail coupon today for full details—just attach to your letterhead

MAGNETROL, Inc.

5328 Belmont Road, Downers Grove, Illinois

19

Please send me catalog data and full information on Magnetrol Swing-Check Valves

Name_____

PLIDCOFLANGE
PLIDCOFLANGE
PLIDCOFLANGE

...NO OTHER PIPE FITTING DOES SO MANY JOBS SO WELL

Designed for fast, easy installation plus economy

Plidcoflange applications are practically limitless. This versatile pipe fitting may be welded permanently to the pipeline, without shutting down, or bolted in place for future removal.

Plidcoflange slips over end of pipe, mates up with standard flange facings. No flange spreaders, jacks or bars required. Ideal for use as a blind plate flange. Just slide Plidcoflange back to change plates.

Plidcoflanges are available in standard sizes 2" through 12" with 150 lb. A.S.A. steel flanges. Other sizes and pressure classes on request. Send for illustrated brochure.

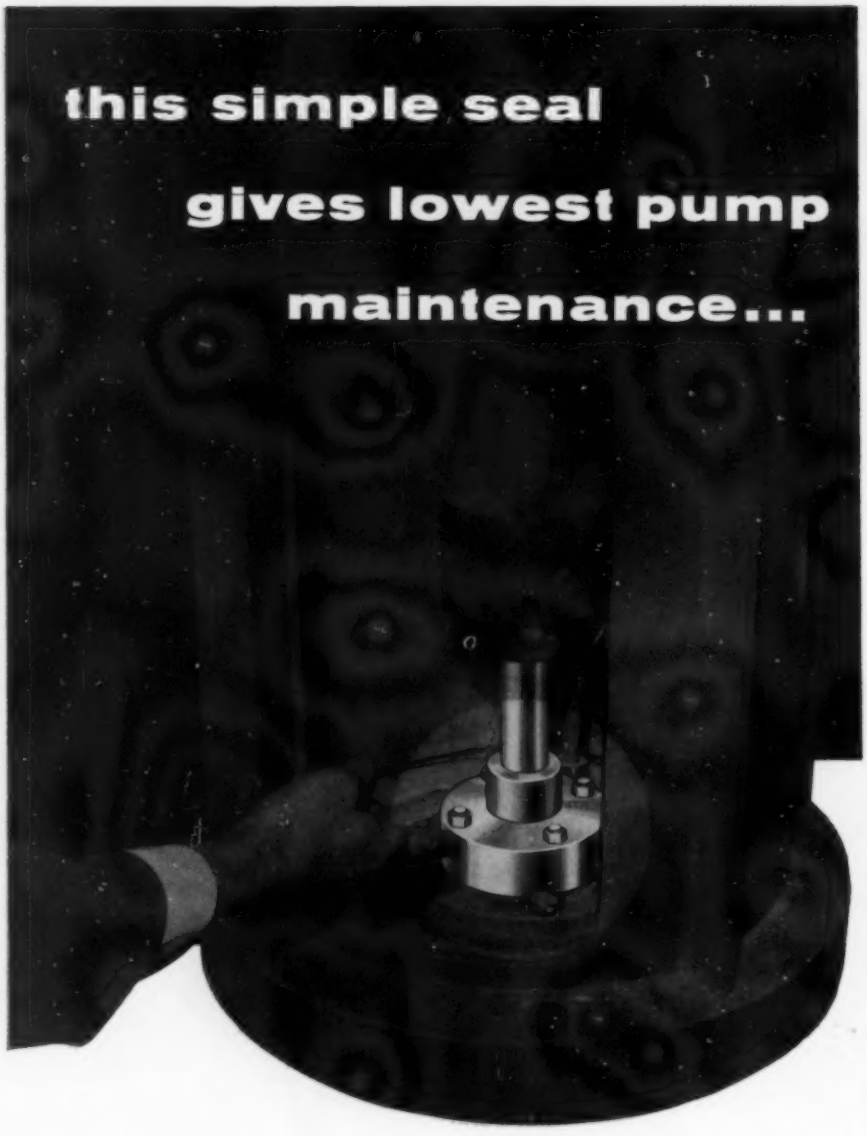
THE PIPE LINE DEVELOPMENT CO.

5350 WEST 130th STREET — CLEVELAND 30, OHIO

REPRESENTATIVES THROUGHOUT THE WORLD

Manufacturers of WELD+ENDS, SMITH SPLIT-COUPLING, SMITH SPLIT-SLEEVE SMITH+CLAMP and other products for the pipeline industry

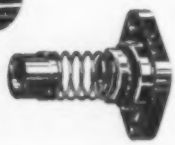
For more data on advertised products, use cards, last page.



Save up to 66% of the time—expensive downtime—needed for installation or service of other mechanical seals used in plant process equipment.

The simple, effective Borg-Warner Type U Seal has no set screws—no close spring tension adjustments. It's fast and reliable.

For plants with a wide variety of pump service requirements, a minimum inventory of parts, and an easy change of gaskets adapts the Type U seal for service at temperatures of from −100 below zero to +650°F, and for pressures from 0 to 1000 psi.



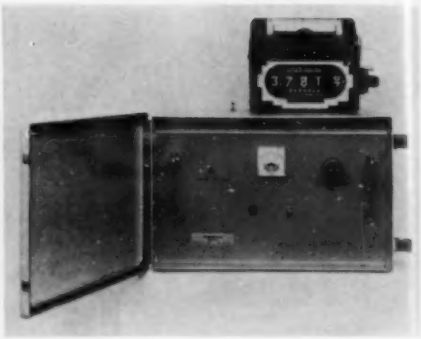
Backed by Borg-Warner and proved in service, these dependable seals give complete safety, even in unattended stations.

Send for the latest Type U Seal engineering information—there's no obligation.

A PRODUCT OF B-W BORG-WARNER

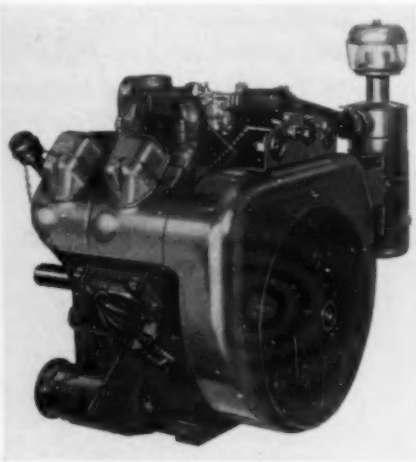
Borg-Warner Mechanical Seals

P.O. Box 2017, Terminal Annex, Los Angeles 54, Calif.



than 99 percent measurement accuracy and is made of reliable solid state electronic components for a long unattended field service life. Readout is presented by visual counter and printed records.

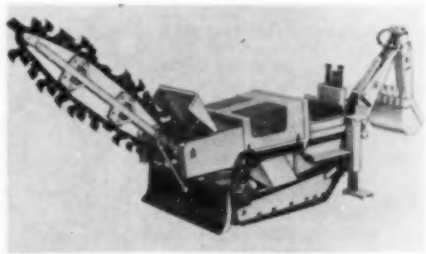
For more data, circle **No. E5** on Readers' Service Card, last page this issue.



Air-Cooled Engine

A new valve-in-head air-cooled, 60-hp, V-4 engine has been developed by Wisconsin Motor Corporation. Designed for heavy-duty application, the Model V-460D ranges from 36 hp at 1,400 rpm to 60.5 hp at 3,000 rpm, and develops 1,650 inch/pounds torque at 1,600 rpm. It has a displacement of 154 cubic inches, features 7.1:1 compression ratio, and weighs only 521 pounds.

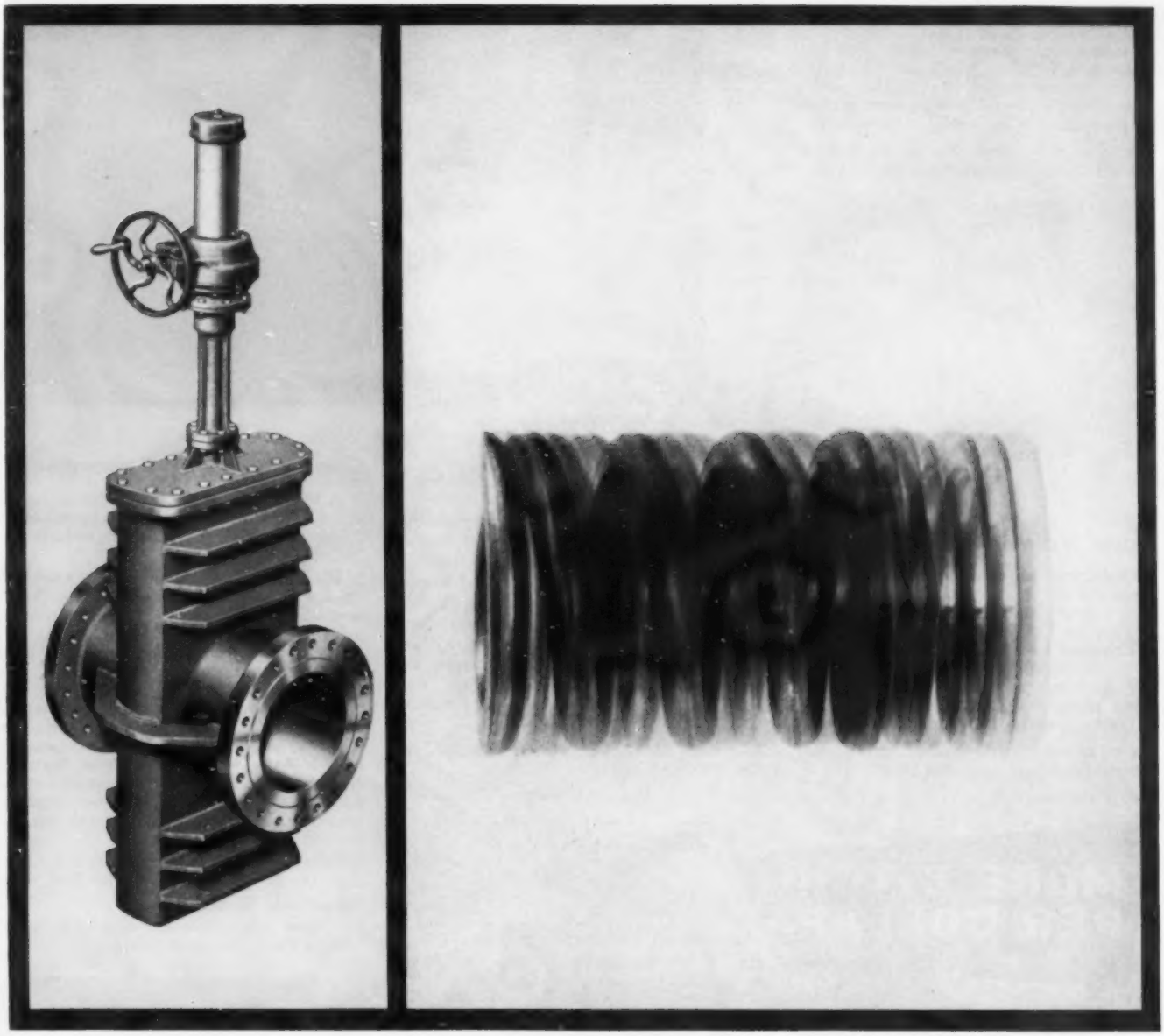
For more data, circle **No. E6** on Readers' Service Card, last page this issue.



All-Around Machine

A small backhoe, trencher and dozer, all in one unit, has been introduced by Davis Mfg. The T-78 can cut a trench from 3 to 38 inches wide and 8 feet, 4 inches deep. The backhoe can be used to trench in rocky areas, make bell holes or for other special work and the dozer can be used for backfilling.

The unit trenches at speeds up to 840



Crane fabricated pipeline valves with the seal that springs into action.

Mounted in any position, Crane's new 150 and 300 Pound fabricated steel conduit pipeline gate valves deliver smooth, turbulence-free flow, and positive, bubble-tight shutoff. This positive, leakproof closing is due to Crane's unique spring-action, floating seal.

Here's how the seal works: Spring-loaded seat ring plates press seat ring against disc for the primary seal. Line pressure forces disc tightly against downstream seat ring, and achieves a double sealing action by forcing the upstream seat ring against the disc. As an added safety feature, spring control permits excessive pressure in the valve body to bleed off into the line.

Incorporating field tested and proven features developed for Crane's 400 and 600 Pound cast steel full-way conduit-type gate valves – the new Class 150 and 300 fabricated steel valves are first choice for every petroleum and gas pipeline service.

Available 14" to 30" with flanged, butt-welding or flanged-by-welding ends. Catalog Nos. 150 pound–1190TF (flanged), 1191TF (butt-welding); 300 pound–1390TF (flanged), 1391TF (butt-welding). Meet all applicable ASA and API specifications. With handwheel, bevel gear, electric motor or cylinder operator.

For complete details contact your Crane Distributor, or write: Crane Co., Industrial Products Group, Dept. R, 4100 So. Kedzie Ave., Chicago 32, Ill. In Canada: Crane, Ltd., 1170 Beaver Hall Square, Montreal.

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HEART
OF HOME AND
INDUSTRY

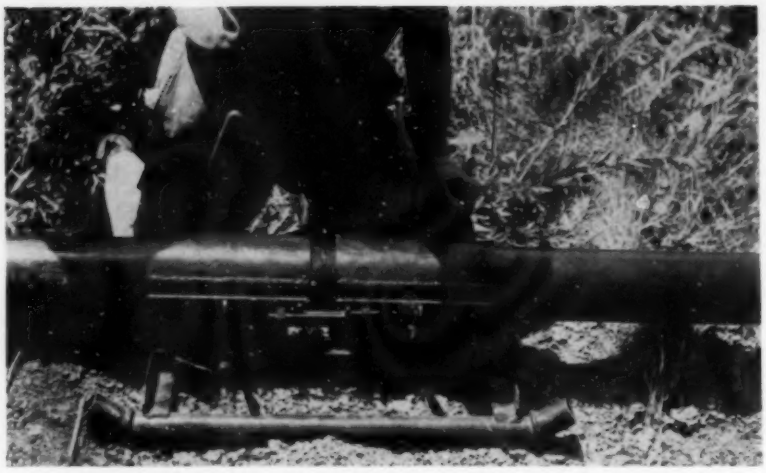
CRANE

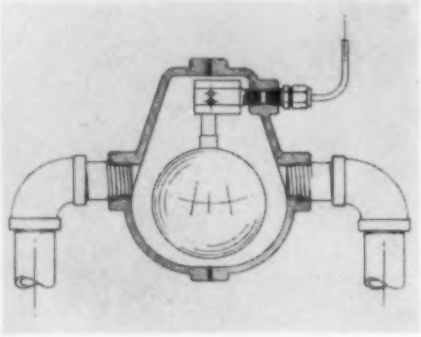
VALVES AND PIPING
ELECTRONIC CONTROLS
PLUMBING
HEATING • AIR CONDITIONING

For more data on advertised products, use cards, last page.

feet per hour from 3 to 18 inches wide and 78 inches deep. It has an extra-large, 10-inch conveyor belt to deliver spoil bank to either side of the ditch. An 18 hp Wisconsin engine drives the digging system and provides power to a hydraulic motor that activates a two-speed transmission.

For more data, circle **No. E7** on Readers' Service Card, last page this issue.





Float Valve

Protection of engines against damage from loss of engine coolant is provided with a new liquid level sensing device developed by California Controls Company.

The float mechanism activates shutdown or alarm devices at the first sign of trouble. The instrument has been tested in diesel pump units, engine generator sets, tractors, scrapers, and earth movers.

For more data, circle **No. E8** on Readers' Service Card, last page this issue.

Polypropylene Resin

A new grade polypropylene resin for pipe has been introduced by the AviSun Corporation. The new resin will process into pipe over a broad range of conditions with little change in strength and impact properties. Pipe extruded from AviSun 1051 has been tested in laboratory and field installations and is designed for gas gathering and distribution systems, salt water disposal and injection lines, flow lines, irrigation systems and other uses.

For more data, circle **No. E9** on Readers' Service Card, last page this issue.

Coaxial Cable Repeater

A low-cost coaxial cable communications repeater with bandwidth capability of 2,500 channels has been introduced by Philco Corporation.

It's less than six inches long, one inch thick and weighs only a few ounces. There is multiplexing equipment at either end of a cable communications system. A user can tap the system at any point to drop or insert circuits wherever required. The system can be buried, suspended or submerged in water. Repeater has potential capacity of 2,500 two-way telephone channels. For two-way television it has capacity for 1,000 two-way phone circuits. Installed every mile in the system, repeaters contain duplexing filters and a transistor amplifier which receives its operating power through the coaxial cable.

(This item supplements Philco Corp. data on pages 318-319 of the Pipe Line Catalog, Third Revision.)

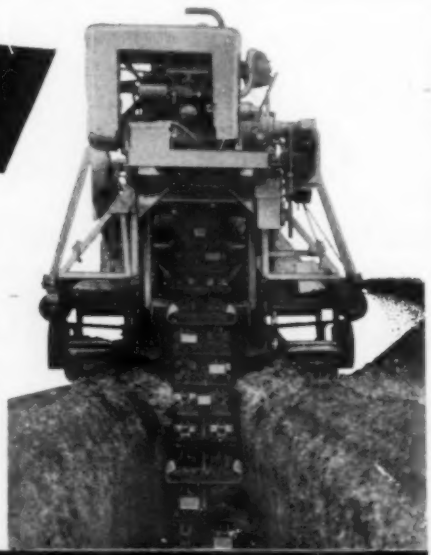
For more data, circle **No. E10** on Readers' Service Card, last page this issue.

MORE DITCH PER DOLLAR

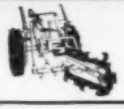
with a Vermeer

POW-R-DITCHER

You just can't buy a lower priced BIG ditcher than Vermeer's 524T POW-R-DITCHER. Low original cost . . . low maintenance cost. Digs 8"-24" wide at speeds of 1' to 15' per minute. Ideal for contractors, municipalities, utility companies, pipe-line contractors and institutions.



PICK THE POW-R-DITCHER TO FIT YOUR NEEDS

4T W-3 W-1 3P 

Please send me FREE information and prices on the complete Vermeer line of self-propelled POW-R-DITCHERS.

NAME.....

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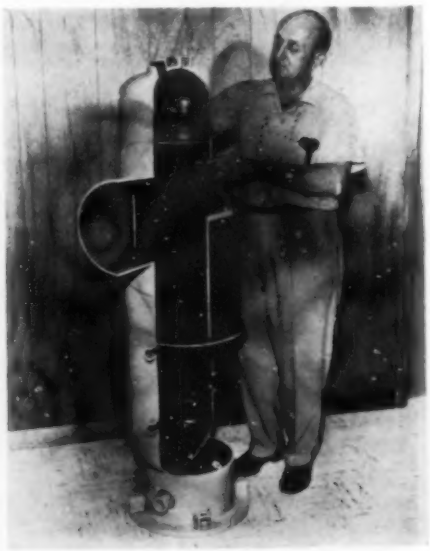
CITY..... STATE.....

☐ Also include information on new Vermeer hydraulic back filler.

VERMEER MANUFACTURING COMPANY

1403 W. WASHINGTON • PELLA, IOWA



Stainless Steel Filters

Stainless steel filters for gas streams where corrosive elements are present have been introduced by Perry Equipment Company. The filter is used in gas transmission stations at both ends of the operation. The filter element is a grid of 24 gage, Type 304L stainless produced by

DE LAVAL

IMO® pump

saves more than...

80% of weight
70% of space
50% of installed cost

...in crude-oil pumping

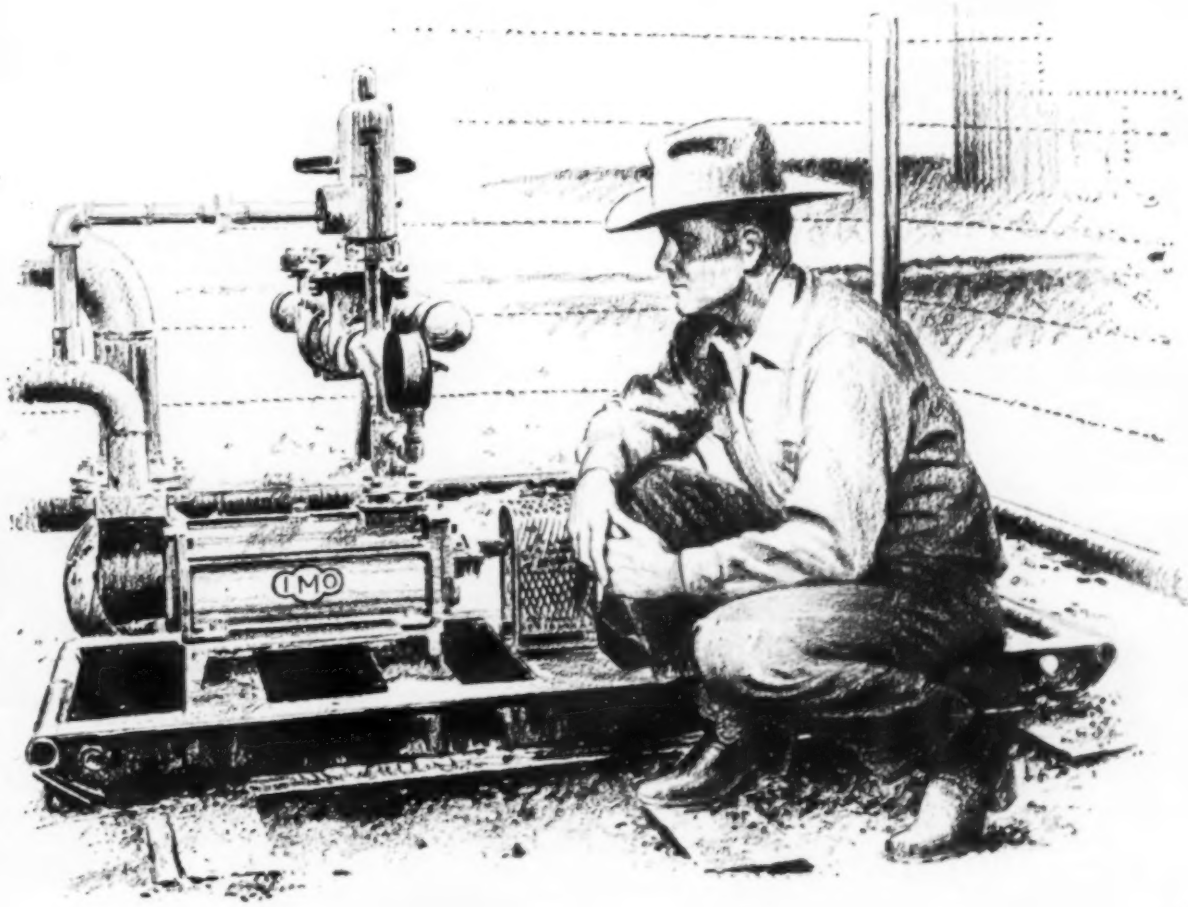
These savings — based on comparison of an IMO pump with a typical reciprocating pump of equal capacity — are among the benefits the IMO pump offers you for crude-oil pumping.

In addition . . .

- The smooth, non-pulsating flow of the IMO pump eliminates the need for the surge suppressors required with reciprocating pumps.
- The IMO pump runs at standard motor speeds. It can be connected direct to a motor without belts, sleeves or reduction gears.
- The IMO pump has a capacity of over 3,000 gpm.
- Maintenance is low . . . the IMO pump has only three moving parts.

In thousands of applications, pumping crude oil and other petroleum products, the De Laval IMO pump is giving outstanding service. It can bring the same advantages to your installation. For application and performance data, selection information, dimension drawings and tables, write for Bulletin IM-3200.

De Laval Steam Turbine Company, Trenton 2, N. J.



IM-DL-104

DE LAVAL · 60 YEARS OF CREATIVITY AND QUALITY

CENTRIFUGAL PUMPS AND COMPRESSORS • TURBINES • IMO® ROTARY PUMPS AND HYDRAULIC MOTORS
MARINE PROPULSION AND AUXILIARY EQUIPMENT • HELICAL AND EPICYCLIC GEARS • TURBOCHARGERS

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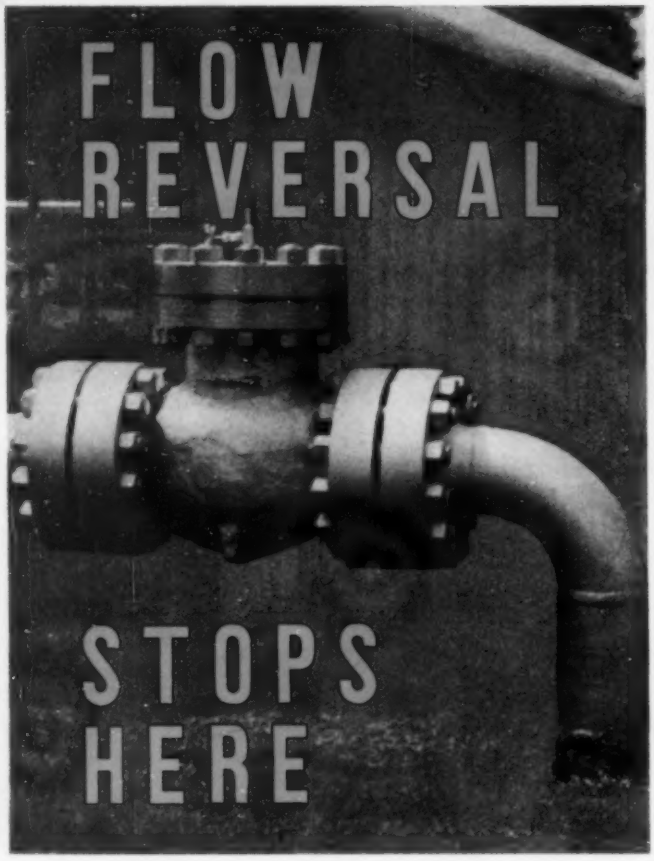


Line back-surge is prevented by a positive, non-slam shut-off of the Daniel piston-controlled check valve. The "floating" piston rides well above the valve seat with line surges, eliminating chatter. Safely handles compressor and pump discharges, steam, gas and vapor flows.

A.S.A. pipeline, refinery and general use valves, 1" - 16", up to 6,000 p.s.i.g.

A.P.I. production flow line valves, 1" - 4", up to 10,000 p.s.i.g.

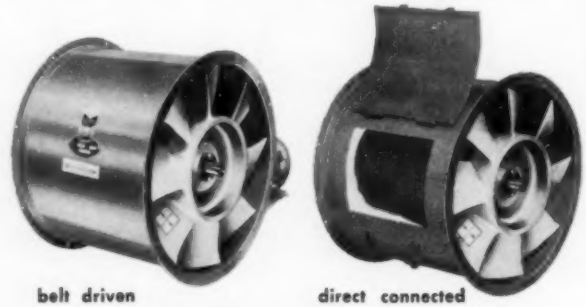
Send for Daniel Catalog Section "H".

DANIEL ORIFICE FITTING COMPANY

P. O. BOX 19097 • HOUSTON 24, TEXAS

high speed - high efficiency

Aerovent's new Tubeaxial Fan, designed around a new 8-blade "Macheta" Airfoil Axial Flow Propeller, offers top performance against medium pressures at speeds to 3450 RPM. Available in 16", 18", 24", and 30" diameters, this unit combines speed, stamina and modern functional design. Easily installed in present ductwork or engineered to new construction, it's the right answer for resistances to 4" SP. Another outstanding development from Aerovent—America's finest industrial fans and air equipment.



belt driven direct connected

WRITE FOR FREE BULLETIN 350

Air deliveries of Aerovent equipment determined in accordance with established and accepted codes and guaranteed by manufacturer.

CERTIFIED PERFORMANCE

Aerovent FANS

Aerovent

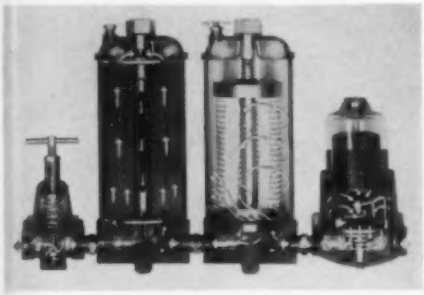
FAN COMPANY, INC.

ASH and ROTH STREETS PIQUA, OHIO

stainless and strip division of Jones & Laughlin Steel Corp.

Gas makes its way through the filter with minimum loss of pressure—but solids and drops of liquids down to 10 microns are trapped by the filter. Particles drop into a sump at the base of the unit.

For more data, circle **No. E11** on Readers' Service Card, last page this issue.

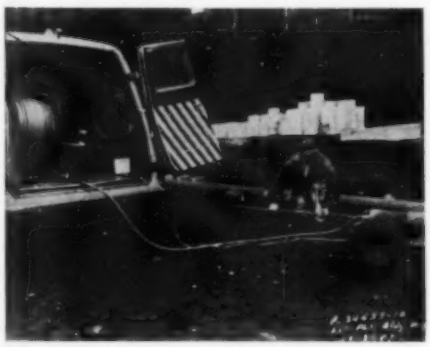


Air Dehydrator

A new compressed air dehydrator package for drying air and ridding it of oil and dirt contaminants has been announced by Wilkerson Corporation.

Rated at a maximum of 10 scfm at 100 psi, the unit can lower the dew point of air to —100° F and removal of oil to 2 ppm. It does not require draining since first stage of the unit has a moisture separator with a built-in automatic sump drain mechanism. Second stage is a filter that removes as small as 3 microns in size, and oil fumes. Following this is a stage for lowering the oil or moisture dew point. Regulator on the outlet controls the air pressure. No electrical or water connections are necessary. The entire desiccant is visible through the dehydrators transparent shell.

For more data, circle **No. E12** on Readers' Service Card, last page this issue.



TV Cameras

The inside of a pipe line is not the best subject for a television show, but when a pipeliner wants to inspect the inside of his line a pipeviewing camera may be the answer.

General Precision, Inc. has introduced a TV camera for inspecting lines as small as 4-inch diameter. The unit is used for corrosion checks, examining valves, to locate obstructions, and to determine if there is liquid present in a gas line. A remote control box provides operation of focus and mirror rotation; it has a built-in fluorescent light source of 30 foot candles at one foot; and it is housed in a stainless steel shell which permits easy insertion into pipe lines.

For more data, circle **No. E13** on Readers' Service Card, last page this issue.

New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers' Index. Simply circle code numbers of items desired—sign and mail card.

Gas Data Book

A 48-page, pocket-sized book on industrial gas data is available from Air Reduction Sales Company. The book, which is bound in leatherette, lists physical and chemical properties of oxygen, nitrogen, argon, helium, hydrogen, carbon dioxide, acetylene and many others.

The booklet also includes conversion tables which are handy for changing volumetric information on the various industrial gases from one equivalent unit of measure to another.

To get a copy, circle **No. E14** on Readers' Service Card, last page this issue.

Check Valves

Darling Valve and Manufacturing Company has released a 24-page bulletin on the Darling 50 line swing check valves. The illustrated booklet describes the revolving double disc principle which has been adapted to these valves.

A pressure rating table on the 2 to 16-inch valve sizes as well as other construction details are included in the brochure. There are basic facts on spring and weight assemblies and complete specifications for the lever and weight, and lever and spring types.

To get a copy, circle **No. E15** on Readers' Service Card, last page this issue.

Flowmeter

A new catalog sheet published by Rotron Controls covers the new 2-inch high-pressure flowmeter designed for both liquid and gas applications.

Design and construction features, connections and dimensions, pressure drop charts, and ordering information are included. The vortex-velocity principle of operation is described along with specific advantages and recommended applications for the liquid Model L2S-H and the gas Model G2S-H.

To get a copy, circle **No. E16** on Readers' Service Card, last page this issue.

Automatic Controls

A technical brochure describing automatic process control systems for pipe lines, etc., has been issued by Electrodynamic Instrument Corp. The 6-page booklet includes characteristics of control systems and gives typical specifications.

Data-transmissioin techniques, display techniques, and data-coding techniques are also covered.

To get a copy, circle **No. E17** on Readers' Service Card, last page this issue.

FLEET-LINE
WELDING FITTINGS

LITERATURE BY *Air Mail*

Code fittings; domestic materials. All orders acknowledged by air-mail or long distance phone and filled at once.

REDUCERS: Concentric and Eccentric, 1" through 30". ASA B16.9, ASTM A234. Schedules 10 to 160, X and XX heavy, stainless steel, chrome-moly and other alloys, genuine wrought iron, copper, aluminum. Special lengths and sizes without delay.

SADDLES, conventional, and for pressure vessel heads Nozzle sizes from ¼" through 24" with skirts to any size. FLEET-LINE saddles weld neatly into place in much less time and with much less melding rod.

FULL-ENCIRCLEMENT SADDLES, nominal pipe sizes 2" through 36". Five types.

REDUCING TEES, Forged Steel, 8" through 30".

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STEEL FORGINGS, Inc.

P. O. Box 276 K Shreveport, La.

REPAIR PIPE LEAKS
QUICKLY
PERMANENTLY
ANY PRESSURE
ANY TEMPERATURE

SKINNER-SEAL
EMERGENCY PIPE CLAMPS for safe, sure lasting repair of splits and rust holes in pipe. No pressure too high. Anyone can apply in a few moments. Made in all sizes, ½" to 12", for steel and C. I. pipe. Stocked by practically all oil supply stores.

SKINNER-SEAL
COLLAR LEAK CLAMPS—for oil and gas lines. Gasket is sealed by gasket container rings—pressure is sealed in . . . air, moisture and gasket-destroying soil conditions are sealed out. Effective under any pressure. Sizes 2"—13" O.D. incl. In stock at oil supply stores!

For over half a century, a complete line of Repair Clamps and Saddles for steel and cast iron pipe. Send for catalog!

M. B. SKINNER CO.
SOUTH BEND 21, INDIANA

Advertisers' Index

• Dot preceding name of advertiser indicates that detailed data on products and services of the firm will be found in current (1960-61) third revision of The Pipe Line Catalog.

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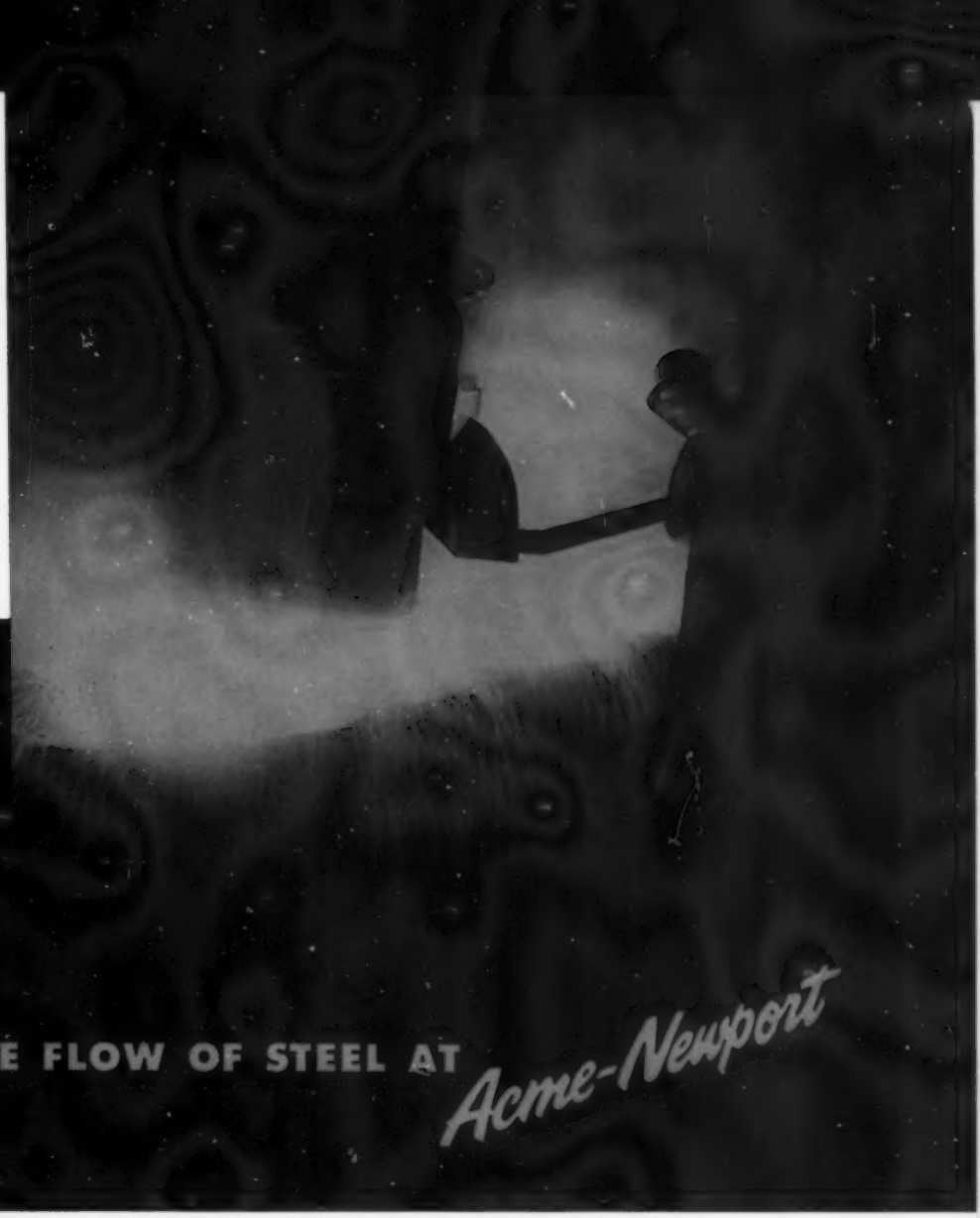

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